RAILROAD GAZETTE

FRIDAY, MAY 15.

CONTENTS.

	PAGE.
ILLUSTRATIONS:	
The Drexel Coupler	332
Grant Locomotive Works	333
Two or Three Novelties	334
Recent French Passenger Cars	335
Sargent Brake Shoe Hanger	335
The Length of Radius Bars	336
Testing Couplings by Shock	336
Double-Latch Reverse Lever	337
Oury's Weldless Steel Chains	337
CONTRIBUTIONS:	
Electric Motors for General Railroad Use	331
Coupler Unlocking Devices	331
Starting Gears for Compound Locomotives	331
"Phenomenal Friction"	331
EDITORIALS:	
Cost of the M. C. B Coupler	338
Electricity and Railroads Again	339
EDITORIAL NOTES	338–339
TRADE CATALOGUES	340
GENERAL NEWS:	
Locomotive Building	341
Car Building	341
Bridge Building	341
Meetings and Announcements	342
Personal	342
Elections and Appointments	343
Railroad Construction	343
General Railroad News	345
Traffic	346
MISCELLANEOUS.	
Technical	337–340
The Scrap Heap	341
Fort Madison Shop Notes	332
Train Accidents in Great Britain in the year 1890	333
Right of Way for Railroads	335

Contributions.

Electric Motors for General Railroad Use.

AUGUSTA, Me., April 28, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Have read with interest your article on "Electric Motors for Railroad Use," and would ask if you have not lost sight of one great credit to electric energy for propelling railroad trains, viz., the reduction of wear and tear on railroad beds.

Express trains are now every year demanding larger and stronger locomotives with which to do their work, and have already reached, in some cases, 100 tons, with tender. Are not these motors growing more and more extravagant by the great wear on roadbed and iron, and the demand for heavier rail and stronger bridges? Is not there an increasing loss of energy by the rapid exhaust, on the fast trains, the steam not having due time to escape after doing its work?

Now, when electric energy supersedes the monster locomotives, reducing all weight on the rail, at any one point, to not more than 30 or 40 tons, and changing the reciprocating motion of the cylinder to the circular motion of the electric motor, we would have unlimited speed, without loss, as in cut-off engines. Then, also, instead of depending upon the friction at one given portion of the rail to start and move the whole train, each car would be set in motion by its own friction on the rail. Would not this be "a consummation devoutly to be wished for?" AMOS WILDER.

Coupler Unlocking Devices.

THE HINSON CAR COUPLER CO.,
CHICAGO, May 5, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The recent action of a number of leading railroads in indorsing the vertical-plane coupler, and the reasons given, must be gratifying to members of the Master Car Builders' Association, who, despite a relentless and often unjust opposition, have, in dignified silence, steadily adhered to their action in indorsing this type of coupler after carefully considering its mechanical principles, and rely upon the test of actual service to vindicate their action. Having demonstrated that even in its present imperfectly developed form this type is, from an economic standpoint, preferable to the link-and-pin coupler, its universal adoption and greater development seem assured if the policy of approving only such features as can be conscientiously indorsed from a mechanical standpoint be adhered to.

The Association will be asked to adopt an unlocking device which, from the necessities of its form, must be placed on the ends of cars, fastened above and extending over the deadblock. The convention will be asked to indorse and adopt such a device on the special plea of uniformity. No one has yet, so far as we are informed, had the courage to urge it as a sound mechanical principle. The fact that, before adopting this form of unlocking device, people now using it made numerous ineffectual attempts to unlock their couplers from below, indicates that judgment and experience demanded such a device, but that their skill was unequal to the task, and through repeated failures they were finally compelled to resort to the one now in use. This makeshift the convention will not only be asked to indorse, but adopt, under the plea that the situation demands uniformity. While uniformity in merit is desirable, uniformity in demerit and weakness is worse than irregularity.

The mechanical weakness of this device, in the vicissitudes of freight service, is too apparent to require comment; and the encumbering of a million or more of cars in the near future with two or more millions of such devices, is likely to lead to results which will jeopardize the success of the M. C. B. coupler; and the effort to foist it on all railroads and coupler companies suggests the thought that some one fears in the struggle for superiority the application of the law of "the survival of the fittest." . . .

If the Association were to adopt this device, it would, of course, relieve those now using it from any necessity for improvement and debar still greater development. Will the Association, as skilled mechanics, adopt this device? Will it prefer universal weakness to some irregularity? Will it relieve the companies now using it from all necessity for improvements? Will it saddle its adopted type with an element of weakness? Will it proclaim to inventors that, even though they produce an ideal automatic vertical-plane coupler, their success will be profitless and therefore useless? Or, will it continue to dignify itself by indorsing only what its judgment as an association of skilled mechanics approves?

F. A. SMALL.

Starting Gears for Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in your issue of April 24 a letter from Mr. F. W. Dean regarding starting gear for compound locomotives. While I quite agree with Mr. Dean with respect to the two-cylinder type of engine, I cannot say that his criticism of the Lindner starting gear is quite correct. It is true that the Lindner system has been under development since it was first put into use, but so has the intercepting valve, of which there are now at least six different types, all of which perform practically the same general functions, but which differ in construction. Each inventor claims some difference which makes his device a success where the others are not. The differences are minor ones, yet if we take the statements of each of the inventors of the intercepting valve, we find that all other intercepting valves are bad. In the face of so much conflicting evidence, it is hard to reach any conclusion; perhaps all of them may be bad. The fact is, the intercepting valve has been more changed and subjected to more alteration than the Lindner gear.

All of these devices, whether Lindner or intercepting, have the same end, to assist the locomotive in starting when the valves in the high or low pressure steam chest cover both ports. At such times, if the steam in the receiver can back up against the high-pressure piston, it will reduce the effective pressure of that piston by a considerable amount. By placing an intercepting valve between the receiver and the high-pressure cylinder, this back pressure on the high-pressure piston can be removed, provided that the intercepting valve can be kept tight. If not tight, then it is of no use. The valve is a large one, and large valves are extremely uncertain.

Mr. Dean says: "Steam is a rapid traveler, and leakage through these holes must amount to considerable, especially at slow speeds." Now, the holes in a Lindner gear, to which he refers, are extremely small, and his statement goes to show that a very small leakage in the large intercepting valve will prevent its being of any value. Just how one is to know when these intercepting valves leak does not appear. Mr. Dean does not state that all of the steam which passes through the small holes of the Lindner apparatus is used in the low-pressure cylinder, and therefore not entirely lost. All locomotive valves leak more or less; they cannot be kept tight. An extremely small leak of a large slide valve would permit the paassge of much more steam than could possibly pass through one small hole of the Lindner apparatus which is open only a portion of the stroke.

If the advocates of the different compound locomotive starting devices do not take on a fairer and more temperate tone, I think we shall all be compelled to believe that none of these devices is of any practical value. These gears are of value only when the locomotive happens to stop at a certain particular position of cranks, and there are only two such positions in a revolution; and further, if a train has only a little slack in it any sort of starting gear is of no use whatever; and, still further, most master mechanics would prefer to back up on a train and start ahead rather suddenly, rather than to bother with a lot of apparatus that is hard to get at and the condition of which is uncertain.

I remember that a correspondent in the *Railroad Gazette* of April 11, 1890, called attention to the action of an intercepting valve on an American compound, and showed how on a freight train it was of little use. This seems to be true, even if they have the closest coupling possible. Now I would like to ask Mr. Dean, through your columns, just why a well designed compound locomotive with the large cylinders which it should have to be in accordance with the best compound engine practice, actually needs any starting gear whatever except a steam jet to the receiver, if the engineer knows what he is about and is aware of the position of the cranks at the time of starting?

Mr. Dean's large experience with valves of all kinds should enable him to answer whether an intercepting valve, as commonly proposed, can be kept tight for any considerable length of time under the conditions of locomotive work, and whether such valves, unless tight, would be of any great value in assisting a compound locomotive to start a closely-coupled passenger train; it seems to be evident that they are of no use for other trains. A FRIEND OF THE COMPOUND.

"Phenomenal Friction."

3301 *Baring street*,
PHILADELPHIA, PA., May 11, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of May 8, page 321, I note your extract, without comment as to value, from the *Journal of the Franklin Institute*, under the head "Phenomenal Friction." The writer describes as new to himself what has been familiar to mechanics for years, and has been made use of in legitimate manner in many cases, but not as proposed by him.

He calls attention to the fact that a rotating spindle, free to slide endwise in its bearing, requires much less power to move it while revolving than it does when standing, or not revolving, under the same load or pressure.

The friction of rest is usually much greater than the friction of motion, but has nothing to do with the experiments described by Mr. Cooper. A well-finished steel spindle resting in a well-finished and well-lubricated steel bearing, when starting from a condition of rest that has continued long enough to permit the spindle to settle through the film of lubricating oil and to come in contact with the bearing, will require a very much greater amount of force to put it in motion than will be afterward needed to keep it in motion. In this case the resisting force may be attraction of cohesion acting between the highly polished surfaces of the steel that must be free from all irregularities of surface.

So long as there is oil between the metal surfaces, the cohesive force resisting the start is that due to the viscidity of the unguent itself; but when the metals have come into close enough contact to drive out the oil, a stronger force comes into play and the resistance to starting is in many cases strikingly great, feeling to the hand that endeavors to start the motion like a positive stop that yields suddenly as soon as the force is overcome and new oiled surfaces brought together.

I have noted this many times in the spindles of turning lathes, when both spindle and bearing have been made of highly polished steel. In taking hold of the cone pulley to turn the spindle, a resistance is felt leading to the impression that the bearings have "stuck" until an extra force applied breaks the binding force and the resistance seems to vanish; and the continued motion in comparison is free from any sensible frictional resistance. In the case of a sliding spindle iathe the phenomenon mentioned by Mr. Cooper is shown and is familiar to all workmen.

This seeming diminution of frictional resistance to end sliding motion, while in the act of revolving, is taken advantage of by makers of testing machines to overcome the frictional resistance of the leather packing on the hydraulic rams. Unwin in "Testing of Materials of Construction," in his description of a testing machine, on page 234, says: "To eliminate the friction of the small indicator piston, it is kept in rotation by the pulleys shown at the end of the recording apparatus. The friction at a high speed is small, and practically the friction of the cup leather of the small piston seems to be neutralized by this rotation."

It would be hardly worth while to mention this instance of the advantage to be derived by the knowledge of the principle involved, if I did not call the attention of those not familiar with the subject to a consideration of what is taking place when power is applied to slide the spindle in its bearing while at rest and when revolving.

A spindle nearly 4 inches in diameter is 12 inches in circumference, and for the sake of argument may be considered as moving at the rate of 400 feet when revolving at that speed per minute. Each point on the spindle moves a distance of 400 feet each minute through a path that is circular, but if laid out on a plane would represent a right line 400 feet long. The driving power is overcoming frictional resistance of the spindle and in the experiments cited has not been given, and if we now try to slide the spindle endwise a distance of 1 foot in one minute, it would be as if, with a forward motion of 400 feet on a plane, we caused another force acting at right angles to the driving force to make the moving point pass over the diagonal of a rectangle, one side of which is 400 feet and the other 1 foot. According to the well-known "resolution of forces" the diagonal of this rectangle will be to the length of the long side of the rectangle as $\sqrt{160{,}000}$ is to $\sqrt{160{,}001}$, or as 400 is to 400.00124.

Knowing the power required to cause rotation under any given pressure, one can graphically determine just what power will be required to cause end motion at any given speed with absolute certainty as to the result. Each moving point of surface at high speed can be deflected from its line of motion by a force very much less than that required to give the primary motion, just as the water of the river deflects the cannon ball that strikes its surface at an acute angle, and causes it to skip over the water in successive leaps, to plunge with little loss of force into the target. The cannon ball in passing from the gun would travel in a right line but for the force of gravity, that is constant, while the propelling force that started the ball is lessened by the friction of the air.

Let a ball fall from a high tower, it will fall toward the exact centre of gravity of the earth below it if no other force is acting at a right angle to the force of gravity. A breath of wind that would not disturb a ball resting on a solid plane will cause the falling ball o miss

the spot that is "plum" below the starting point of the fall.

This phenomenal (?) friction can be classed with the deviation of the falling ball or with the possible deflection of a rifle ball by the smooth surface of a leaf that it happens to strike in its flight.

The power expended in rotating the plunger to diminish the frictional resistance of the packing does not lessen the total friction of the machine, but increases it, *taking it from one place and adding it to another.*

The hasty publication as new of phenomena that have been well known for years, and, through wrong perception of cause, the suggestion of uses that are not useful, is an error, in this instance intensified by the recommendation that the frictional resistance of planing machines would be diminished by replacing flat or plane V sliding surfaces or "ways" by revolving cylindrical guide bars.

A planing machine fitted with revolving guides in place of plane guides will take less cut if the machinery to rotate the guides be driven by the same belt that gives motion to the table. Every new motion added and every new moving part will add to the total frictional resistance of the machine. Hence, the fewer the moving parts the better. The power required to rotate the guide bars is the same as, if not greater than, that required to move the table on flat guides.

We try to force a cork into the neck of a bottle by a straight push, and we exhaust our strength more and do less than if we give a twist to the cork in pushing, and so add the force of other muscles to those required to push it without rotation.

Presenting as phenomenal what is really not so is apt to lead those who cannot view things evenly to wrong conclusions.

COLEMAN SELLERS.

The Drexel Vertical Plane Coupler.

To meet the demand of some railroad men for a coupler that is so nearly automatic that the knuckle can be opened from the side of the car without going between the cars, the coupler, shown by the accompanying design has been brought out, and is known as the Drexel coupler. It has some peculiar features.

It will be noticed that the pivot pin is at some distance from the end of the coupler, but it is made upon the M. C. B. lines, and in that way differs from some other couplers where the pivot has been drawn back, concerning which it has been claimed that they cannot be constructed on the standard contour. The moving back of the pivot pin permits the flange at *A* on the knuckle, which protects the top and bottom pivot lugs. This is an important matter with malleable iron heads. The blows are now received by the steel knuckle, and not by the malleable iron lugs.

The knuckle is made light by coring, as shown at *B*, fig. 2, which is a section on *K L*. The pivot pin is made larger than usual, being 1½ in. in diameter, as shown in fig. 3, and by reason of the large diameter of the pivot lugs, namely, 4¼ in., they are not as thick as ordinarily made in malleable iron couplers, as shown at *C*, fig. 3. This reduction in thickness enables a better quality of malleable iron to be used. The buffing blows in this coupler are taken on the end of the pivot lugs over a large bearing area, shown at *A*, fig. 1.

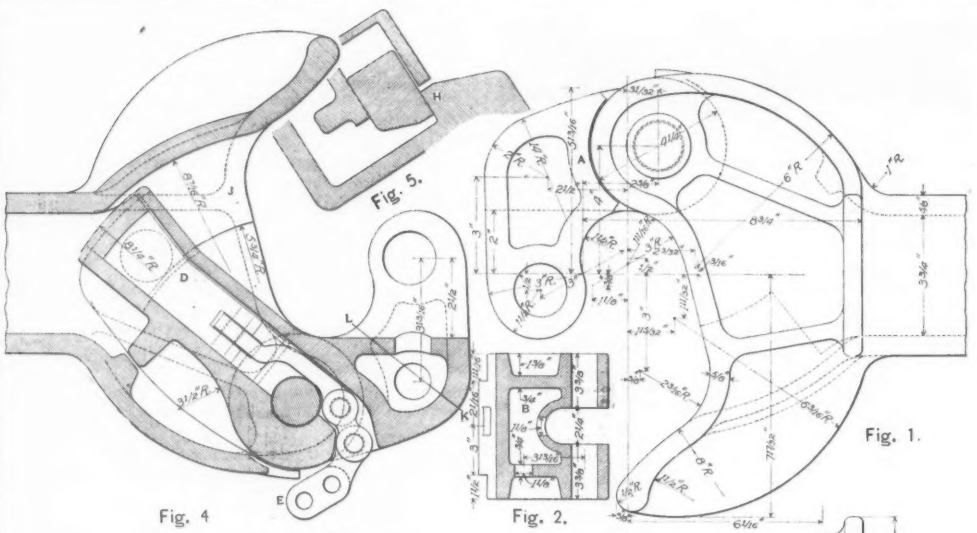
This coupler is peculiar in having the lock placed in the tongue of the knuckle itself. It consists of a tilting block, shown at *D*, figs. 3, 4 and 5. As shown, there is a connecting link chain of peculiar construction, shown in fig. 4 at *E*, attached to the lock in the tongue of the knuckle. The chain is pulled by a lever arranged on the side of the car, and in this way the lock of the knuckle at *F*, fig. 3, is lifted into the recess *G*, and in this position will clear the lug on the drawhead, shown by dotted lines in fig. 3, and at *H*, fig. 5. The knuckle can then be swung open by means of a further movement of the lever at the side of the car. Thus, it is not necessary for a brakeman to go between the cars to open the knuckles, the point of attachment of the chain being outside of the pivot pin, and pulling of the chain causes the knuckle to swing open. When the knuckles return to position, the inclined plane on the drawhead at *J*, fig. 4, lifts the lock over the projection *H* in the head.

One of the noticeable changes in this coupler is the moving in of the link-pin hole in the end of the knuckle, to reduce the breakages with the link.

This coupler is offered either in malleable iron or cast steel as desired, and when made of steel it is claimed to be one of the strongest couplers in the market, and, further, it is strictly automatic. The offices of the company are in the Rookery Building, Chicago.

Fort Madison Shop Notes.

The shops of the Santa Fé road at Fort Madison, Iowa, were staked out some two years since on quite an extensive scale, and are situated about two miles south of the old town. Large tracts of land were purchased along the river and extending back for quite a distance, and what was three years ago laid out in farm lands and melon patches is now a flourishing town. Only a part of the shop buildings as originally planned by the company have been completed. The large sixteen-stall machine shop has the walls up and is designed for two traveling cranes; the foundations are in for several other buildings.



THE DREXEL COUPLER.

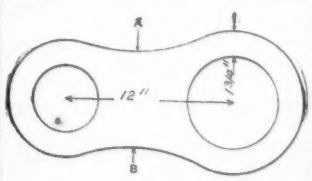
The temporary machine shop is of frame and is fitted with machinery of the most improved designs. The smithshop, freight repair house, woodworking shop, coach shop, storehouse and 28-stall roundhouse complete the list of the plant. This does not include a good-sized foundry at the south end of the property, operated by Chicago parties.

This road is now lettering all cars A., T. & S. F. instead of G. C. & S. F. and C., S. F. & C., etc., the outside line cars being renumbered, and these changes made whenever the cars come in for repairs.

The work done at this point is simply on repairs for both engines and cars. The capacity for turning out the former, with six pits, is about 100 a year, covering general repairs, no new equipment being erected here. Quite an order is being filled for 10-wheel engines of the well-known Schenectady type, with Laird guides, I section main rods, plain side rods, elliptical tank springs and rigid trucks, extension front ends and bootleg stack. The check-valve arrangement is an improvement over many of those in use. A small globe valve is placed just above the check, so that, in making any needed repairs in the connections back of this, this valve may be closed and thus obviate the blowing off of steam.

Engines coming in for overhauling are having the heavy wrought-iron ring at the inside of the bottom of the mud drum taken out, and a somewhat heavier ring put around the outside. This gives room enough for a man to crawl into the boiler after the flues are out without removing the dry-pipe and connections, which is frequently quite a saving. For washing out, the curved hose nozzle does good work by being revolved through the mud drum.

The practice followed here for staying cracked wheel-hubs or crank-pin hubs is much better than the single strap, and is as shown in the sketch. The wheel centre is cut down from the face of the hub at the lines of the two circles, enough to setin this 1¼-inch, wrought-iron plate, which is shrunk on in the usual manner. The line at *A* is a circle of large radius tangent to the two smaller circles. The distance between *A* and *B* should not be contracted.



The fireboxes on many of the engines are fitted with brick arches resting on three firebox tubes running up from just below the flues to the backsheet a few inches below the crownsheet, large plugs being placed opposite the ends of these tubes for purposes of washing out. This practice has more recently been taken up on some of the other lines, and is meeting with considerable success.

In many of the front ends they are using the annular nozzles, which are giving very satisfactory results; also the new standard cast-iron bootleg stack is taking the place of the older designs used for so many years by this company. On some of the old locomotives now in for rebuilding the cinders are ejected from the front end through a horizontal pipe reaching over two feet out from under the centre to a point over the rail, the valves being worked from the cab, and the accumulated cinders forced out by steam. These are now being taken off as they become clogged, and only a small portion is thrown out, except by the use of the poker and hand-hole.

Quite a number of 28-in. stroke engines (of which this company has 50) are run into this point. These 10-wheelers were built by the Baldwin Works, and have seen good service on parts of the system. One of these had an arrangement (probably a labor-saving device of some runner) for blowing out the mud drum from the cab, a rod passing forward to a lever which worked a valve at the base of the drum.

In the toolroom sets of standard gauges are kept and constantly referred to; and in the matter of lessening the number of sizes, this department is conforming as much as possible to some standard dimensions for a given size engine, and, in the purchase of motive power from different makers, is requiring greater uniformity in various ways than heretofore, and thus is cutting down the expense of maintenance. Especially does this make itself felt in the storehouse account, as the storekeeper is always obliged to keep an emergency supply, of some amount, of all parts liable to break, and any reduction in the number of equipment standards proves quite a saving in the interest on the cost of idle material.

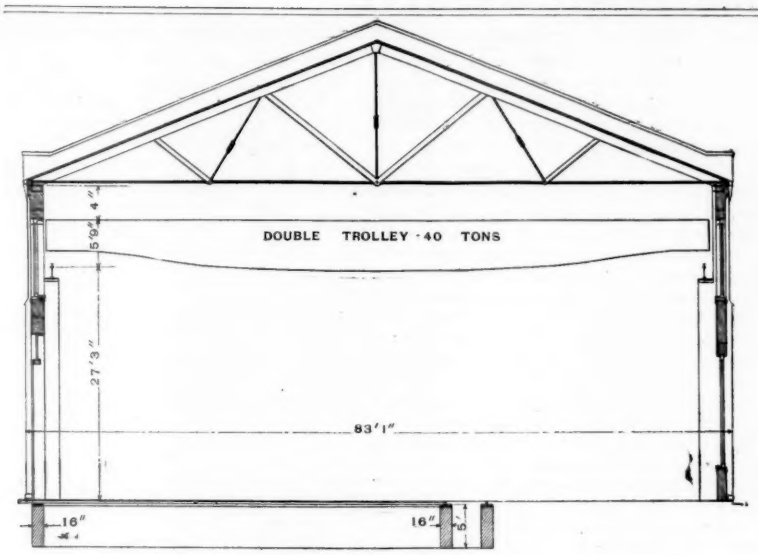
Much attention seems to be given here to the maintaining of a good condition of the tires, the aim being to order the engine in for re-turning often enough to prevent any great amount of double flange. This is not only a great help to the track department in keeping up frogs and switches along the line, but is an absolute necessity with engines running into or through interlocking stations, as the double flange plays havoc with the detector bars, and causes delay as well as other expense.

All the grounds about this plant are scrupulously raked over, and the refuse burned; so that notwithstanding the large amount of repair work done here, the general appearance of the shops as a whole is excellent.

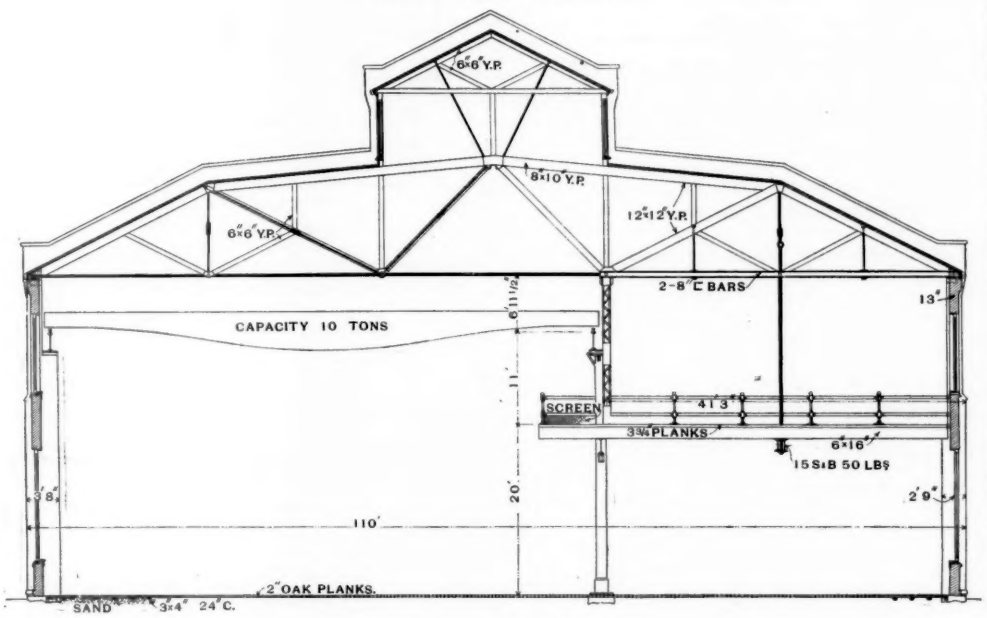
Grant Locomotive Works.

Among the many enterprises which have been located at Chicago during the last few years, the combined effect of which has helped in producing such a tremendous increase in the population of the city, and which have been attracted there by the energy and push of the people, the Grant Locomotive Works has probably received as much attention from the legal fraternity as any other. "Section 21," now locally celebrated, has been a bone of contention for many months past, and the title has finally been decided good by the highest courts in the state. It is of little surprise that the fight should have been carried on so vigorously, as the original figure in the deal was absurdly small as looked upon from the present standpoint.

The location of the property is eminently suited for just such a manufacturing plant on account of its proximity to several of the larger lines of railroad entering the city, and, besides, the Western Indiana



Section through Erecting Shop.



Section through Machine Shop.

SHOPS OF THE GRANT LOCOMOTIVE WORKS.

Belt Line running past the east side of the property has transfer connection with all roads coming into Chicago. The main lines of the Chicago & North Western and the Northern Pacific lie a short distance to the north, and the Burlington and the Illinois Central roads are not far from the south line of the track. Suburban transportation facilities are very good, stations on the Wisconsin Central and Chicago, Burlington & Quincy being close at hand, and the time necessary to reach the Grand Central Station or Union Depot is about 25 minutes. Each road runs a large number of trains daily, and the service is otherwise excellent. Franchises have been granted also for electric tramways on three sides of the section and connecting with the present cable system.

There are two distinct companies operating in this Section. The Land Association bought the 651 acres of land, and sold sixty acres to the locomotive works in the northwest quarter of the Section. The capital stock of each company is $800,000, all paid in, the holders in the land company subscribing for a like amount in the engine company.

The ground plan of the works has been blocked out by the President, Mr. E. T. Jeffery, whose experience in locomotive building has been of many years standing, and the whole design is made with the purpose of being able at any time in the future to double the capacity of the plant. Each shop is so situated that it may be extended as shown by the dotted lines. Thus the machines and smith shops may be added to on their north ends, and the hammer shop and erecting shop on the west ends. On the west side of the boiler shop there is space allotted for an 80 × 105-ft. tender shop, and the addition to the wood-working shop will be utilized as a paint shop.

The erecting shop has twelve pits with 20 ft. centres, and room at the back for small tools. On the east side of the machine shop there is a gallery extending the entire length of the building, which will give large space for light lathes, planers and special machines. There are to be traveling cranes in the machine shop, erecting shop, boiler shop and foundry, but whether electricity or steam is to be used for motive power has not yet been decided upon. The double crane in the erecting shop will be of sufficient size to lift the largest engines likely to be built.

Proposals are now being made by quite a number of heavy contractors for the erection of the entire plant, and all bids are to be in by the middle of May, when work on the foundations will be commenced and vigorously pushed. All buildings and tracks shown in full lines are to be built immediately, the plan being at the north end to push the ladder track farther north whenever it is thought advisable to enlarge the buildings in that direction. Fifteen-degree curves are used throughout the works with a few exceptions, and the tracks are so arranged as to be easily added to. The station grounds at the southeast corner are for the Northern Pacific suburban service, Sixteenth street being 150 feet wide, so as to give ample room for double-track. Stations are located every half mile on this line as well as on the double north and south track on Robinson avenue, thus bringing the immediate shop vicinity within easy reach of the Court House or centre of the business portion of the city, which is about six miles distant.

The buildings are to be of brick and of mill construction throughout, the roof trusses to be of the combination type, with wooden struts and iron tie rods. The roof itself is to be of an asphaltum composition. The cross section of the machine shop, which we show, gives a good idea of the general style followed in the trussing and walls of the larger buildings. Overhead light and ventilation are had through the sash in the monitor deck.

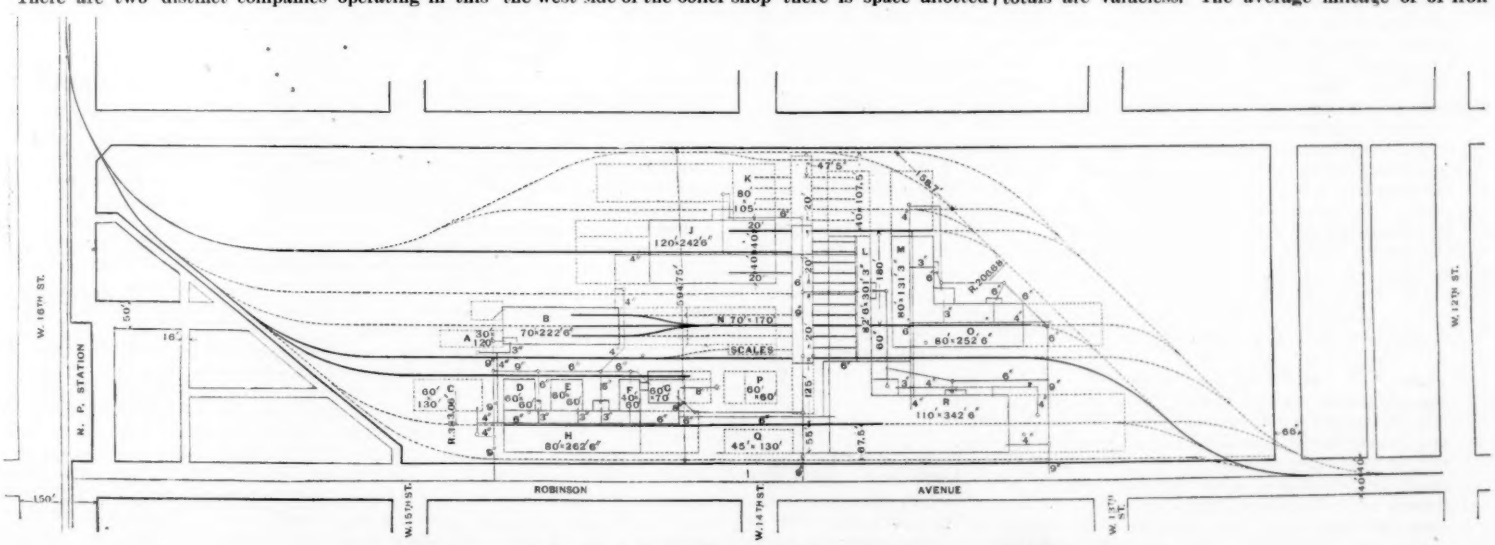
The dynamo-room furnishes power for electric lighting, and transfer table, as well as for any other special wor

The shops at Paterson, N. J., are to be drawn upon for a portion of the machinery for the Chicago plant. All the best tools and those built for particular lines of work will be shipped West, the remainder being sold to outside concerns, and a large amount of new machinery purchased for completing the quota of tools necessary in works of this size.

The company expects to be ready for locomotive work by the first of next year, and is making preparations for an output of 250 engines per year. This capacity it expects to double before many years, which expectation seems to be warranted from the fact that this is the only locomotive works west of Pittsburgh; that it is in the largest railroad centre in the United States and that Chicago as a supply point for specialties as well as raw materials, is rapidly becoming second to none.

Train Accidents in Great Britain in the Year 1890.

The accident record of the British Board of Trade for the last calendar year shows 18 passengers and 12 employés killed and 496 passengers and 147 employés injured in train accidents. The report also gives casualties from other causes, and the total number of persons killed in connection with the movement of vehicles was 1,076, precisely the same as in 1889. In addition to this the companies also report accidents to persons on the railroad companies' premises, but not connected with the movement of cars in any way, bringing the total number of personal accidents, reported by the companies, up to 1,135 killed and 11,568 injured. The report gives the number of failures of tires, of axles and of rails, but the number in use is not given, so that the totals are valueless. The average mileage of 51 iron



PLAN OF TRACKS AND BUILDINGS, GRANT LOCOMOTIVE WORKS, CHICAGO.

NOTE.—*A, Lumber; B, Wood Room; C, Pattern House; D, Core Room; E, Cupola; F, Brass; G, Boiler House; H, Foundry; J, Boiler Shop; K, Tender Shop; L, Erecting Shop; M, Hammer Shop; O, Blacksmith Shop; P, Dynamo House; Q, Office and Stores; R, Machine Shop.*

crank or driving axles which failed was 217,399, and of 71 made of steel, 229,379 miles.

Twenty-four accidents were especially inquired into in the last quarter of the year. Investigations of this kind made during the previous nine months have been heretofore reported in the *Railroad Gazette*. We summarize some of the more interesting of these investigations for the fourth quarter:

On the Caledonian Railway, Nov. 25, at Carlisle, a special passenger train of three cars was derailed at a frog and the engine went over an embankment, killing the engineer. Major Marindin found that a frog 1 in 9 had been put in place of one that was 1 in 10. He also found that the curve was shorter (less than 600 ft. radius) than was the case when the track was first laid and reported to the Board of Trade. The guard rail was a good deal worn, and in some cases was 2½ in. from the running rail. The speed was 35 miles an hour. This was too high, the engine being a six-wheeled coupled saddle tank "of an unsteady type." Marks on the rail were somewhat confusing, but it is concluded that an engine flange ran upon the point of the frog. It is recommended that the curve be improved and that the speed upon it be limited to 15 miles an hour; also that the company move the junction further west to a point where the line is straight.

On the Furness Railway, Nov. 27, at Seaton, the boiler of a freight engine exploded, the middle plate having become grooved along the longitudinal joint on the left side. The boiler was 20 years old, and had run 437,000 miles. It had not been examined internally for five years, which was too infrequent. General Hutchinson regrets to observe that the engineer was required to work 13 hours and 50 minutes in one day.

At Shenfield, on the Great Eastern, Nov. 30, at 7:43 p. m., the engineer of a passenger train started without noticing that the starting signal was at danger, went through a cross-over track without knowing it, and was derailed at a runaway switch, 1,900 ft. from the place of starting. He had just backed on to his train, and went ahead again before the cross-over switch had been straightened, not knowing but that he was on the main line. The fireman is blamed for not looking at the starting signal, and the engineer "neglected to give the usual whistle before starting." There was snow on the ground, and some moonlight, so that the darkness afforded him no excuse for not seeing his surroundings. The runaway switch led to the edge of a bank, and the engine and one car went over the bank. General Hutchinson presents the question whether it would not be better for the derailing switch to run into rails extending along close to the main rails. A porter is blamed for not informing the signalman when the engine had backed on to its train. The signalman was working 16 hours a day one day in a fortnight, but this was once too many, says the General.

At Victoria Park Station, on the Great Eastern, Dec. 10, during a dense fog, an engine arriving with a passenger train was moved forward over a switch, so as to run around the train and pull it back, but the runner set back on the same line he had come from, and violently collided with his own train, into which several passengers had already entered for the return journey to Stratford Market. The engineer, instead of looking at the disc signal or at the switch rails, moved backward when he thought he heard the switch rails move. General Hutchinson thinks the fireman, who was on the side next the platform and should have noticed that he was close to it, "must have been using very little circumspection." The signalman is not to blame, as in consequence of the density of the fog he "was naturally waiting for the engineer to whistle" for the switch before he turned it.

On the Great Northern, near Leeds, Dec. 24, during a dense fog, a passenger train ran into an empty engine standing on the main track, throwing off the men upon it and allowing it to run uncontrolled down a grade to Leeds Station, where it crashed into the buffer stops at 30 miles an hour and killed a woman. The passenger train in this case was two hours late and the signalman admitted it to the section because he had entirely forgotten that the engine was upon the main line, where it had been waiting about six minutes. There was a red tail light on the engine, but the men on the passenger engine were anxiously looking ahead for signals and they are therefore not blamed for failing to see the tail lights. There is a rule that where an engine is thus standing on the main track of a busy line during a dense fog the fireman shall go to the signal cabin. Major Marindin thinks this rule should be made more imperative, and free from all ambiguity as to the time which may elapse before it is acted upon. "If, whenever a train or engine is shunted across to stand upon a wrong line, or comes to a stand in order to be crossed, or to be put into a siding, the fireman or the guard has to go *at once* to a signal-box, as he has now to do in the case of a fog or falling snow, I believe that accidents arising from the forgetfulness of a signalman would be very rare. In most cases they might be prevented by the adoption of one of the systems of electrically interlocking the block instruments and outside signals, and in a case such as this by a mechanical locking between the home signal and the signal for entering the siding, such as was brought into use by the London & Southwestern at Locomotive Junction near Vauxhall, after a very bad collision there in 1880, and which is a very useful safeguard at places where the crossing of engines is a very frequent and regular occurrence." The engineer and fireman of the empty engine had been on duty for 18½ hours; it is admitted that this was abnormal on account of the fog, but the regular hours of these men (13) were too long.

On the Great Western, at Norton-Fitzwarren, near Taunton, Nov. 11, a passenger train running 50 or 60 miles an hour struck the front end of a freight train waiting on the main track, and 10 passengers were killed. This accident was reported in the *Railroad Gazette* of Dec. 5, and it will be remembered that it was due to the forgetfulness of a signalman on a dark night. The engineer of the freight train failed to exhibit a red light, as he ought to have done, and he is therefore held partly to blame, but the passenger train approached on a slight curve, so that it does not appear how effectually a red light would have appealed to the passenger runner, as he might have thought it was on another track. Colonel Rich, who makes the report, says the present rules are very good if carried out, but that "lifting-bars may sometimes be advantageously used to lock the signals of a line on which trains are waiting," so as to check forgetfulness of signalmen. He is informed that many signalmen put one of their flag sticks in the spring catch of the signal levers in such a case as this. He would suggest that "a steel bar, a loop, a wedge or some other mechanical contrivance marked 'Train Waiting' should be fixed to the levers." It appears that it was not for want of room, but owing to a mistake of the signalman, that the freight was placed upon the main track instead of a siding. The road is now building additional tracks to relieve the congestion of traffic at this point.

On the Great Western, Dec. 13, at Swindon, in a foggy night, a passenger train ran into a pilot engine standing on the main track, the signalman having forgotten that he had given the engine permission to stand where it did. This case was somewhat similar to that at Leeds, but there was a discrepancy in the testimony as to the density of the fog, and the fireman claimed that it was not sufficiently thick to require him to go to the signal cabin, as laid down in the rules. General Hutchinson does not accept this argument. The runner failed to promptly heed a torpedo placed on the rail by a man standing near the home signal, because the signal was off. For this he is blamed, as he had no right to assume that the torpedo was not properly used; but "great allowance must be made," as the signal was moved in a manner to mislead him. General Hutchinson refers to the schemes proposed since the Norton-Fitzwarren collision for checking signalmen's forgetfulness, and says that "one or other of them will no doubt have to be adopted if it proves to answer the requirements." The tender of the passenger train in this case, which was heavier than any car in the train, had only a hand brake.

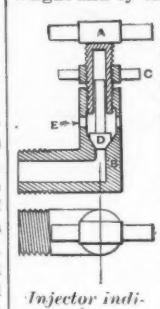
On the Highland Railway, Dec. 2, at Dalwhinnie, a passenger train of 12 cars was nearly all derailed at a facing point switch while running at about 20 miles an hour. It appears that one of the two engines hauling the train was cut off and run ahead, after which the switch was turned to let the train upon another track; and the looseness of this switch caused the trouble. The locking-bar was found to be bent out, and the detector-bar did not go through the proper slot in the switch rod, so that the inspector, Major Marindin, believes the testimony of those who say that the signal was off, and that therefore the faulty connections permitted the signal to be cleared before the switch rail was pulled home. Detailed recommendations are made looking to the correction of various mechanical details. It is also "a question whether weighted switch rails with slotted joints, which were introduced after an accident at Dava in 1886, ought not to be abandoned." The object of the weight is to make an automatic switch for trains running in a trailing direction, but "there seems to be some risk of the rails sticking." Detaching pilot engines from moving trains involves several irregularities, and the inspector "hopes that it will be found possible to adopt the usual practice of other lines," which is to stop the train.

On the Lancashire & Yorkshire, Nov. 8, near Chorley, a passenger train ran into a landslide and was derailed. It was quite dark and the engineman is not blamed, though, as usual, he states his speed lower than it probably was. Trains had passed within half an hour, and the section-master had examined the road about three hours previously, so that no special censure is passed upon any one, but the company has laid additional drains, has driven piles and has lightened the slope of the cutting. It is, however, important that the spot should be watched for some time to come.

Two or Three Novelties.

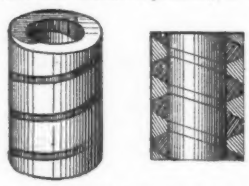
We show here some of the appliances which are offered by the United Railway Supplies Company which has recently been organized and does business in New York.

The injector indicator is intended to call the attention of the engineman if from any cause the injector stops working. The construction is plainly shown in the cut. It is placed in the feedpipe just above the level of the water when the tank is full. When the injector is working, the valve *D* is held on its seat both by its own weight and by the suction of the injector. If, however, the injector flies off, the steam passes down the feedpipe, and, raising the valve *D*, escapes into the cab in two jets, through the openings *E*, with sufficient force to immediately attract the engineman's attention. The height to which the valve *D* is raised is regulated by the hollow screw *A*, in which the stem of the valve *D* works. *A* is held in any desired position by the lock nut *C*. In case it is necessary to use the injector to heat the water in the tank, the lock nut *C* is loosened and *A* is screwed down on top of the valve *D*, thereby holding it tightly on its seat. The demands upon the attention of the engineman are so great that it would appear that a mechanical device of this kind, which will automatically compel his attention, is of considerable value.

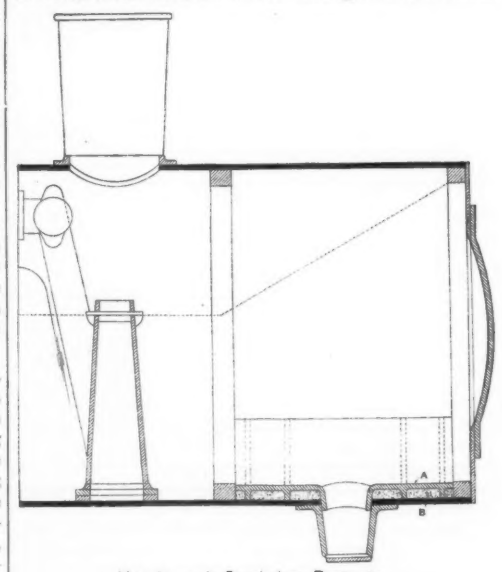


Injector indicator.

Brown's metallic packing is not new. It was patented some years ago, and has been a good deal used in marine and stationary work. The principle is obvious from the cuts. The packing is composed of spiral strips of brass or other metal, and babbitt. Then as the bearings wear, the babbitt is forced out by bringing pressure on the ends of the packing. It is recommended for piston rods and valve stems. The engines of the new fireboat "New York" are packed with this packing.


Brown's Metallic Packing.

The smokebox protector is intended to preserve the bottom sheets in extension-front ends, which are frequently burned out or cracked by ignition of the coal collected there when air enters through various leaks.



Henderson's Smokebox Protector.

The device shown is simply a layer of fireclay about 1 in. thick on the bottom sheets of the extension front, as shown at *B*. On the top of this is placed a light casting, *A*, which prevents the fireclay from being disturbed. It is said that the cost of applying this device need not exceed $5. It is standard on the heavy freight engines of the Pennsylvania, Norfolk & Western and Shenandoah Valley railroads. The company grants licenses to use this device.

New Forms of French Passenger Cars.

The advance which has been made during the last few years in the first-class passenger equipment of French railroads is well illustrated by an article in a recent number of *Les Annales des Travaux Publics*, in which the exhibits of cars at the expositions of 1878 and 1889 are compared, and several of the new or improved forms are illustrated. The accompanying illustrations show the more notable departures from the common type of European passenger coaches. The letter *L* denotes the location of the lamps, and the letters *W* and *P* the closets.

Fig. 1 represents an arrangement of compartments adopted by the Midi Railroad. The end compartments are of the ordinary eight-place form, but the centre compartments contain but four seats, three of which can be converted into beds, as indicated in the figure. A toilet-room is provided for each of these centre compartments. In another arrangement used by the same company, one of the end compartments is provided with a toilet-room, while the middle compartment and that at the other end can be thrown *en suite*, one toilet-room serving for both.

Fig. 2 shows an arrangement adopted by the State Railroad. It will be seen that there is a passage extending through the car, connecting the end platforms which are inclosed. There are four six-place compart-

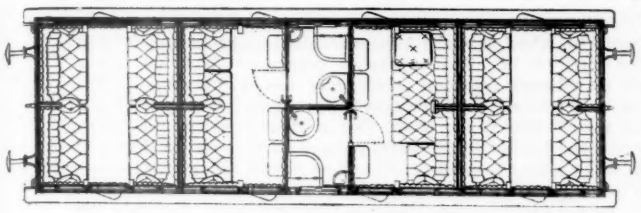


Fig. 1.

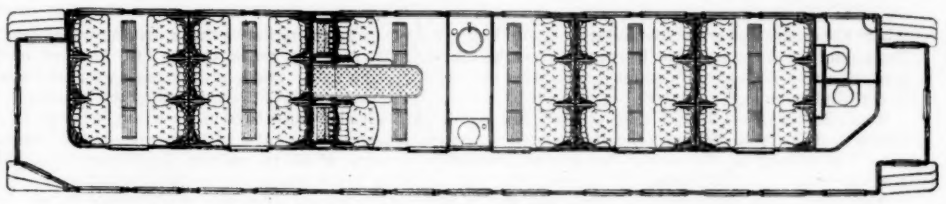


Fig. 2.

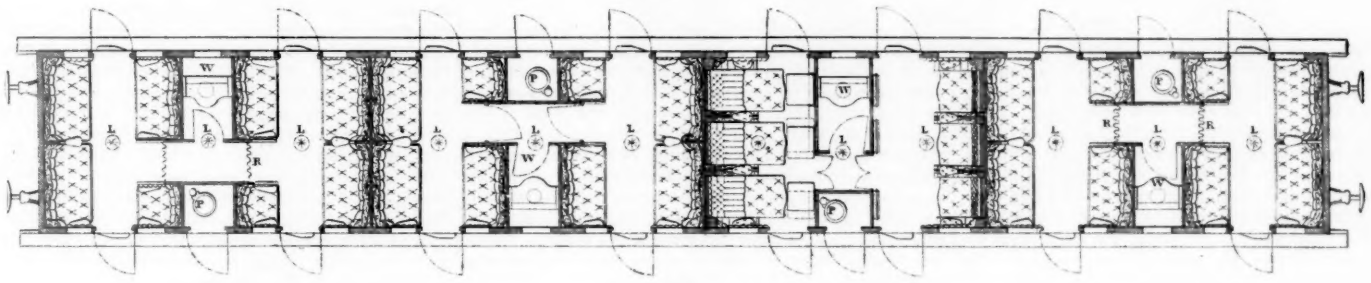


Fig. 3.

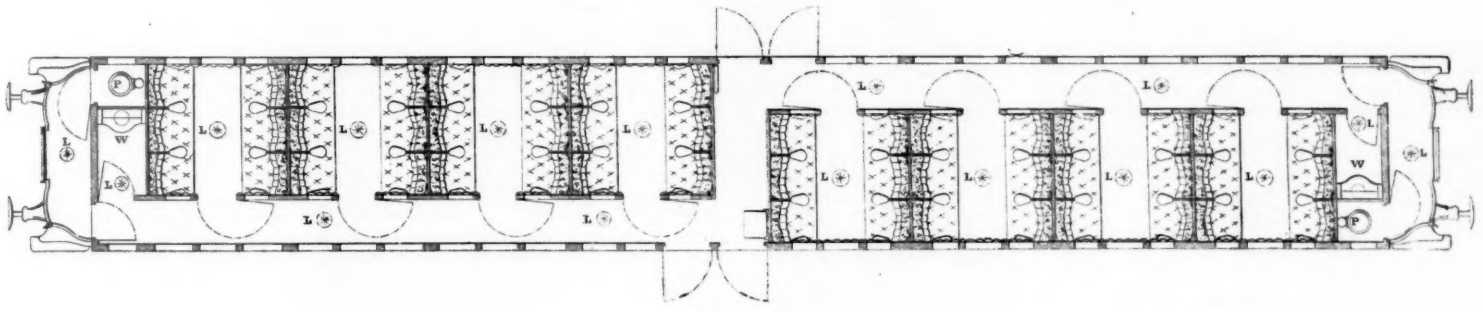


Fig. 4.

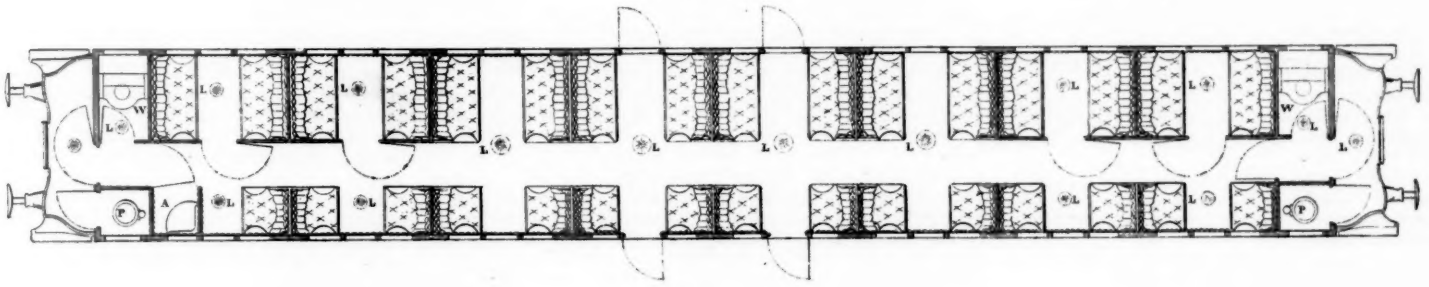


Fig. 5.

RECENT FRENCH PASSENGER CARS.

ments, and two compartments containing but three seats each, which can be extended, as illustrated. The car body is 53.5 ft. long, and is mounted on trucks. Figs. 3, 4 and 5 represent different forms adopted by the P. L. & M. Company. All of these cars are mounted on four-wheel trucks, and are provided with hot-water heaters and toilet-rooms.

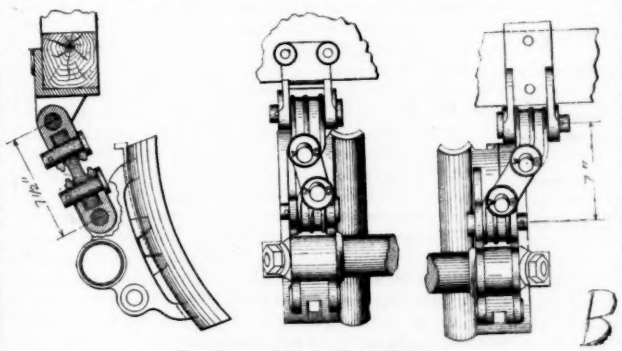
The following table gives the length, total weight and weight per passenger of the cars which are illustrated, and also of other modern French cars:

RAILROAD AND CLASS OF CAR.	Length and width of car-body. Feet.	Total weight empty. Pounds.	No. of passengers.	Weight per passenger. Pounds.
P. L. M. 4 compartments, Standard type	29.8 × ...	31,400	32	980
Midi. Fig. 1	29.5 × 9	25,400	24	1,058
Ouest. 2 ordinary compartments and stateroom with toilet	25 × ...	23,100	21	1,100
Compagnie Française de Matérial des chemins de fer. Similar to fig. 4.	52.5 × ...	54,050	48	1,124
Est. 2 seven-place and 2 six-place compartments, all connected by passage Toilet	31.4 × ...	30,900	26	1,184
Midi. 3 compartments with toilets.	25.9 × ...	23,400	20	1,168
Etat. 3 compartments. Old type remodeled	23.8 × ...	22,000	18	1,224
P. L. M. Fig. 3	67.1 × 9.2	79,500	48	1,655
P. L. M. Fig. 5	64.6 × ...	81,300	47	1,730
Orléans. 7 six-place compartments. 4-wheel trucks. Closed platforms. Toilets	55.9 × 9.8	72,700	42	1,730
Nord. 3 staterooms with toilets	28.9 × ...	28,000	16	1,747
P. L. M. Fig. 4	67.4 × 9.8	83,200	48	1,733
Etat. Fig. 2	53.5 × 9.7	57,300	30	1,910
P. L. M. 3 staterooms with toilets	31.9 × ...	38,900	9	4,324

The Sargent Improved Brake Shoe Hanger.

The advantage derived from the application of flanged brake shoes to car wheels has been considerably reduced by reason of the cutting and grinding action occurring between the wheel flange and shoe flange when the wheel moves sideways, as in passing a curve or low joint. Not only does the grinding occur in the case of shoes bearing on the wheel flange, but also with the common shoe which bears only on the wheel tread. When the wheels move transversely by reason of excessive end-play in boxes, the resistance to side motion of the beam brings one wheel close to the wheel flange with considerable pressure, materially assisting the rail in producing a sharp flange.

The device illustrated is intended to do away with the objections enumerated, inasmuch as it prevents the binding of the shoe and wheel flange. The beam is free to move sideways with the wheel. The shoes always remain vertical and cannot exert any pressure transversely against the wheel.



The Sargent Brake Shoe Hanger.

It is shown in connection with the standard Pullman truck No. 5a equipped with triple brake. In this case the Pullman standard hanger has been replaced by two malleable castings and a wrought iron link. The castings fit into the Pullman standard holder and brake head, using the same pins as the old hanger. The link then couples the castings, two small pins completing the connection. The device can be applied to the beam on these trucks in a very few minutes with little labor. It is compact and strong, yet self-adjusting, permitting the beam to swing laterally, and to and from the wheels. This device is made by the Congdon Brake Shoe Company, Chicago.

Right of Way for Railroads.

Last week we gave an abstract of Mr. J. A. Hall's paper on this subject, read before the American Society of Civil Engineers last Wednesday evening. The paper called out a good deal of discussion.

Mr. Robert L. Harris agreed with Mr. Hall, saying that in his experience where the right of way was in charge of the Chief Engineer there had been but little, if any, unnecessary trouble, and the negotiations had been conducted with system and advantage to the company; but when the negotiations had been in charge of a man not under the direction of the Chief Engineer there had been difficulty and trouble. He called attention to the necessity for strict truthfulness and honesty of representation in all land negotiations. Describing land with the centre line of the road as the base line, was approved by the speaker, but allowing farmers to occupy and cultivate land by the side of a road was considered as liable to lead to future complications.

Mr. C. J. Bates cited the example of the Baltimore & Ohio's Chicago line in Ohio, where the policy was always to buy outright, so as to have the land in fee, without chance for it to revert to the original owner, and asked if land could not always be acquired in that way.

Mr. O. Chanute and others thought this depended on state laws, and that in some states nothing more than an easement could be obtained.

Mr. Charles B. Brush thought that blue prints and other sun pictures were unsatisfactory for permanent records, and called attention to the danger of accepting them in the registry offices of the country, saying records of permanent value should be made by hand. He thought the forms of right-of-way contract referred to by Mr. Hall one sided, and in favor of the railroad company; a roving commission to occupy any portion of a man's farm, and that the arrangement to be satisfactory should be distinct and well understood, and the points

where the centre line crosses boundaries should be given. Regarding the services of a lawyer he thought his co-operation very necessary, but that it should be confined to certain limits.

Mr. J. Foster Crowell said that engineering requirements had little to do with legal knowledge, which should be secured at the outset, but it was absolutely necessary that this knowledge should be under the direction of the chief engineer. He cited the case of one right-of-way agent not so controlled, who, to keep the cost per acre down, made agreements which added greatly to the cost of construction.

Mr. Edward P. North thought all would agree that an engineer who started out to acquire right of way without legal assistance would be as apt to come to grief as a lawyer who tried to build a road without engineering assistance; that in general a road employing a great legal light to secure right of way independent of the control of the chief engineer would have its right-of-way matters more or less mismanaged; and that a lawyer should be selected and employed by the chief engineer, reporting to him and to the engineer immediately in charge of construction; as, while the engineer is entirely devoted to the interests of the company, his training leads him to do justice to both parties. Attention was called to the different values of land; Mr. Hall dealing with land worth $6 per acre, and Mr. Brush and others with land worth $6,000. The records should be different in the two cases, but in the case of much farm land, describing from a corner, which often is not permanently located or well described, might be more apt to produce suits in the future than the generally accepted practice of describing from the centre line.

After several other engineers had given their views, some proposing to submit a written discussion, it was agreed to call the paper up at Chattanooga.

The Length of Radius Bars.

BY ARTHUR T. WOODS.

The proper length for the radius bars for two-wheel or pony trucks is a subject concerning which there seems to be greater difference of opinion among designers of locomotives than can at first glance be satisfactorily accounted for, particularly when we consider the length of time during which such trucks have been extensively used. But whatever the proportions finally adopted in any case, the first step is evidently the determination of that length for the radius bar which will bring the truck axle radial to the curve.

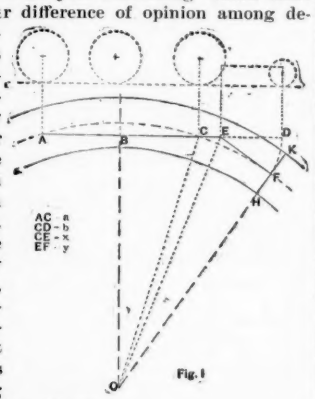
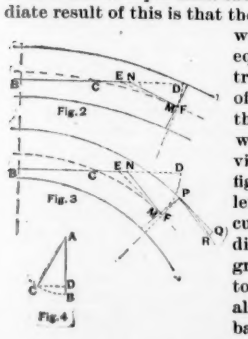


Fig. 1.

Referring to Fig. 1, let $A\ D$ represent the centre line of an engine, $A\ C$ the rigid wheel base, and $C\ D$ the distance between the forward driving axle and the truck axle. The centre of the radius-bar pin should then be so located at E that the truck axle $H\ K$ will be radial to the curve. In the figure the right angle triangles $O\ B\ E$ and $O\ F\ E$ have a common side $O\ E$, and in the right-angle triangles $O\ B\ C$ and $O\ F\ E$ the sides $O\ C$ and $O\ F$ are equal to the radius of the curve. Also the length $C\ D$ is evidently equal to $C\ E + E\ F$. Letting $A\ C = a$, $C\ D = b$, $C\ E = x$, and $E\ F = y$, the values $x = \frac{b^2}{a + 2b}$, and $y = \frac{a\,b + b^2}{a + 2b}$ can be readily deduced, in which, as already stated, a is the rigid wheel base and b is the distance between the centres of the truck axle and of the front driving axle. These equations are, of course, true for curves of any radius, and if the pin E is located by this means, the truck axle will always take a radial position whatever the degree of curvature.

It is not uncommon practice to make the radius bar somewhat shorter than the length found by either of these formulas, or, in other words, to move the pin forword from E to some position, N, figs. 2 and 3, in which $N\ M$ is about 17 per cent. shorter than $E\ F$. The immediate result of this is that the truck axle makes an angle with the radius of the curve equal to $E\ M\ N$, or the outer truck wheel is thrown ahead of the inner one. The truck, therefore, tends to run toward the inner rail. It is obvious from an inspection of figs. 2 and 3 that for a given length $N\ M$, the sharper the curve the greater the angle of divergence, and hence the greater the tendency to run toward the inner rail; and also that the more the radius bar is shortened the greater will be this tendency. The angle through which the truck is turned by shortening the bar is, for ordinary lengths, very small. For example, take an engine having a driving-wheel base equal to 15 ft. and the truck centre 8 ft. forward of the front driving axle. The length of radius bar which will place the axle radial to the curve is by the formula 71.23 in. If this is shortened to 60 in., or about 16 per cent., the angle $E\ M\ N$ will be but a little over one-half of one degree on a curve of 300 ft. radius. It follows from this that a 30-in. truck wheel would travel about one inch in a revolution toward the inner rail, if free to do so. Of course, the angle of divergence would be even smaller on flatter curves, and the transverse movement in a revolution would be less.



The question of practical interest is, what effect does this shortening of the radius bar and consequent tendency of the truck to crowd against the inner rail on a curve have upon the engine? A little consideration will establish the fact that the effects on the wear of the flanges of the truck wheels are directly dependent upon the way in which the truck is hung, whether by parallel, diverging, or converging links, with transverse springs or otherwise. Suppose, for example, that the weight upon the truck is 15,000 lbs. Taking the coefficient of adhesion as ¼, a statical pressure of 3,750 lbs. is necessary to slide the truck wheels on the rails. Conversely, if the truck wheels tend to run toward the inner rail, they can exert a lateral pressure of the same amount. The effects of this pressure on the engine will obviously depend upon the lateral pressure which the weight upon the truck exerts, and this will depend directly upon the position of the swing links, supposing the truck to be so mounted.

To illustrate this, we will assume that the truck under consideration is fitted with links 8 in. long, which are vertical when the truck is central, and that there is no other resistance to transverse motion of the truck wheels. In fig. 4 $A\ B$ will then represent the vertical position of a link, and $A\ C$ the position when the truck wheels have been moved transversely through the distance $D\ C$. The horizontal pressure exerted by the weight is then equal to the weight multiplied by the tangent of the angle $C\ A\ D$, or pressure $\times\ A\ D$ = weight $\times\ C\ D$. If the curvature of the track is such that $C\ D$ = 3 in., the lateral pressure with which the truck wheel is forced toward the outer rail will be about 6,068 lbs. If the truck has no tendency to run away from this rail, this pressure is exerted between the truck-wheel flange and the rail; but if the radius bar is shortened, so that the truck has any tendency to run toward the inner rail, this flange pressure will be reduced to the extent of the friction between the tread of the wheels and the rail, or, in this case, with the assumed figures, the flange pressure would be about 6,068 − 3,750 = 2,318 lbs.

Now, suppose that the curvature is such that CD in fig. 4 is but 1½ in. The lateral pressure due to the weight of 15,000 lbs. will then be but about 2,850 lbs., and, as this is less than the frictional resistance of the wheels on the rails, the truck having a shortened radius bar would run toward the inner rail. The outer truck wheel will therefore run with its flange clear of the outer rail, but as the movement toward the inner rail begins, the swing links are further deflected and additional resistance to the transverse movement is introduced. If this resistance is sufficient to balance the excess of wheel friction on the rails, the flange of the inner wheel will not reach the rail, and the truck will therefore be held with both flanges clear of the rails; but if the friction is the greater, the flange of the inner wheel will be pressed against the rail. It is clear that no general rule which would cover this action can be established, but that it depends upon the lateral resistance due to the swing links, and hence upon the degree of curvature and the method of hanging the truck.* The results which may be expected from any engine on curves of different radii can, however, be readily determined by analysis.

Thus far some of the effects of shortening the radius bar have been noted, without specifying the amount which the bar is shorter than the length which would place the truck axle radial to all curves. The question then arises, what difference does it make whether the bar is 5 per cent. or 25 per cent. shorter than the radial length? It may be answered that as far as the transverse pressure is concerned, it makes no difference, but that the shorter the bar the greater the angle through which the wheels are turned, and the quicker the flange of the inner wheel on a curve will begin to press against the rail if the resistance to lateral motion does not hold it off. But there is another possible effect which a reference to fig. 3 will make plain. In this figure, $P\ Q$ is tangent to the curve, or perpendicular to the radius at P, and $P\ R$ is perpendicular to the truck axle when the centre of the radius bar is at N, and may therefore be taken to represent the direction of motion of the truck wheel. If $P\ R$ be taken equal to the distance which the wheel would travel in one revolution, $Q\ R$ will represent the lateral motion during that revolution. On a curve of 300-ft. radius, $Q\ R$ will be about 1 in. when $P\ R$ equals 100 in., with the other values as already assumed. Taking the resistance to sliding as before at 3,750 lbs., the work done in moving the truck wheels 1 in. laterally will be 3,750 inch-pounds. If the wheel flange is held against the outer rail by the lateral pressure due to the weight on the truck, as it would be on a sharp curve, the work done in holding it there is equivalent to slipping the wheel laterally 1 in. while the engine moves forward 100 in. The additional resistance which the engine must therefore overcome is then in this case 37.5 lbs., which is in addition to the flange friction, and is due solely to the shortening of the radius bar. The flange friction is, however, reduced in this case, as has been already pointed out. On a flat curve, with the same shortening of the radius bar as the above, the inner wheel may be slid on the inner rail in the same way, and in this case the resulting resistance is in addition to the flange friction, which is increased by the shortening of the radius bar. The resistance caused by the sliding of the wheels becomes less as the curvature is reduced.

Another possible effect of shortening the radius bar is the following: When an axle is slewed and a wheel pressed against the rail, the contact between the flange and the rail is no longer directly below the centre of the axle, but is more or less to one side. The location of the contact will depend upon the angle through which the axle has been turned and the shape of the rail and flange, and it is therefore obvious that it will vary with the amount of wear of the rail and flange. In any case, if a wheel is pressed against the rail in this way the pressure parallel to the axle acts with a leverage equal to the horizontal distance that the contact is to one side of a vertical line drawn through the centre of the axle at the rail and tends to turn the axle back at right angles to the rails. The effect of this pressure will be transferred to the radius bar pin, where it will be felt as a lateral pressure tending to force the front of the engine toward the inner rail. But with ordinary proportions it does not appear that the amount of this pressure on the pin would be sufficient to cause any perceptible reduction in the amount of the flange wear of the front driving wheels.

The conclusions which would seem to be deducible from the foregoing are:

1. The effect on the flange wear of the truck wheels of making the radius bar shorter than the length, which will place the truck axle radial to the curve is directly dependent upon the method of suspending the truck.

2. With trucks having little or no initial resistance to lateral movement, the effect of shortening the radius bar is to increase the flange wear of the inner truck wheel on flat curves, and decrease the flange wear of the outer truck wheel on sharp curves. When there is considerable initial resistance to lateral movement, the effect of shortening the radius bar may be to decrease the flange wear of the outer truck wheel on all curves.

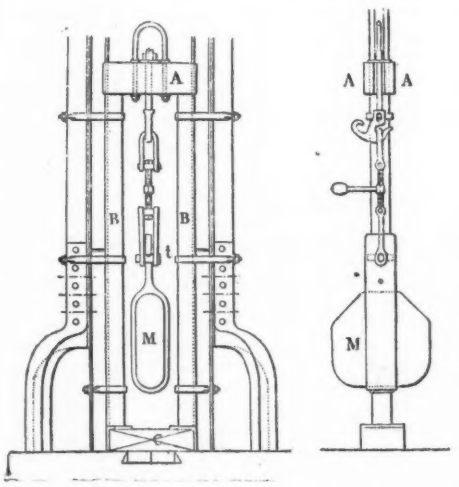
3. Shortening the radius bar increases the resistance of the engine to a noticeable extent on sharp curves, and the greater the relative shortening the greater the resistance.

4. With trucks supported by swing links, shortening the radius bar may reduce the flange wear of the front driving wheels slightly on flat curves, but will have no effect upon such wear on curves of short radius.

*For discussion of the various methods of hanging trucks see *Railroad Gazette*, Aug. 22 and 29 and Sept. 5, 1890.

Testing Couplings by Shock.

The Northern Railroad of France has recently set up in its shops at La Chapelle an apparatus for testing couplings by shock—represented in the accompanying cuts. The coupling is suspended from a wrought-iron crosshead, A, which is arranged to be raised by a windlass; the ram, M, which with its strap weighs 1,170 lbs., is attached to the lower end of the coupling. When this combination is raised to the desired height and let go, the crosshead, A, is arrested by the two square



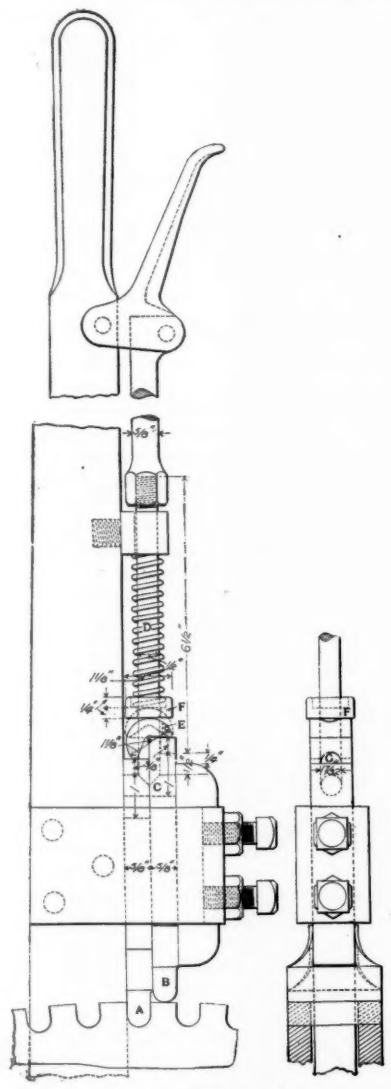
wrought-iron uprights, $B\ B$, resting on a block of wood, C, in turn supported by the anvil block. The coupling is deformed or ruptured, and in the latter case the ram falls upon the block, C. The machine has behaved admirably, and has undergone no injuries from the effect of the shocks to which it has been subjected. The tests are capable of giving useful indications of the material of which the couplers are made, and of their comparative resistances, and may reveal, when the rupture always takes place in the same manner, a local weakness in the pieces, and lead to their modification to obtain uniform resistance.

Double-Latch Reverse Lever—Great Northern Railway.

With the quadrants used on some of the different makes of locomotives the notches are placed so far apart that the runner is obliged to hook down more than is necessary and counteract the excess cut-off by wire drawing his steam. The false economy of this is readily admitted, though not fully realized by engine drivers. To prevent loss in this way a double-latch reverse lever, shown herewith, has been recently designed by C. A. Seley, of the Great Northern.

The ⊥-shaped head *C* works in the slots of the two latches *A* and *B* at *G*. These slots are of different length to allow the cam *E* to depress whichever latch may be over the notch in the quadrant. This cam is one inch thick, slotted to fit the rod *D*, on which it is free to slide, and is pressed down upon *A* and *B* by the block *F*, which is held by the spring above. The arrangement at the lower end is about the same as usual, the latches being confined by a band strap riveted to the lever.

In raising the latch the head *C*, which is simply a cross-



Double-Latch Reverse Lever.

bar on the end of the rod *D*, pulls on the latch *A*, but not on *B*, until it has been lifted ¼ in., when any further raising of the rod lifts both *A* and *B*. When the latch is down, as in the sketch, the latch *B* would drop ¼ in. if the quadrant did not hold it up, or until the top of the slot in its upper end came down to the crossarm *C*.

By making the distance between the centres of *A* and *B* equal to one-half of the distance between the centres of the notches in the quadrant, it will be seen that the fineness of the graduation of this reverse lever is double that of the single latch lever. With this device the extra pieces are easily finished and cost but little, certainly not so much but that the small outlay would be better than supplementing a course-divided quadrant with wire drawing at the throttle valve.

There being but one spring, and all the parts straight and cheaply made, gives this a great advantage over some of the patent latches which have two springs, and whose several pieces are bent to given angles. On account of its simplicity this latch is meeting with general approval on the Great Northern.

Weldless Steel Chains.

We illustrate the very ingenious process by which is produced the weldless steel chain now being put on the market by Messrs. William Reid & Co., of 112 Fenchurch street, London. The blank consists of a cross-shaped bar, as shown in fig. 1, through which, at proper intervals, depending on the size of the links, holes are drilled in the fashion shown. The blank is then notched roughly to the shape of the links by suitable machinery, as in fig. 2, after which it is flattened to prepare it for hollowing out the links, and stamped to round them

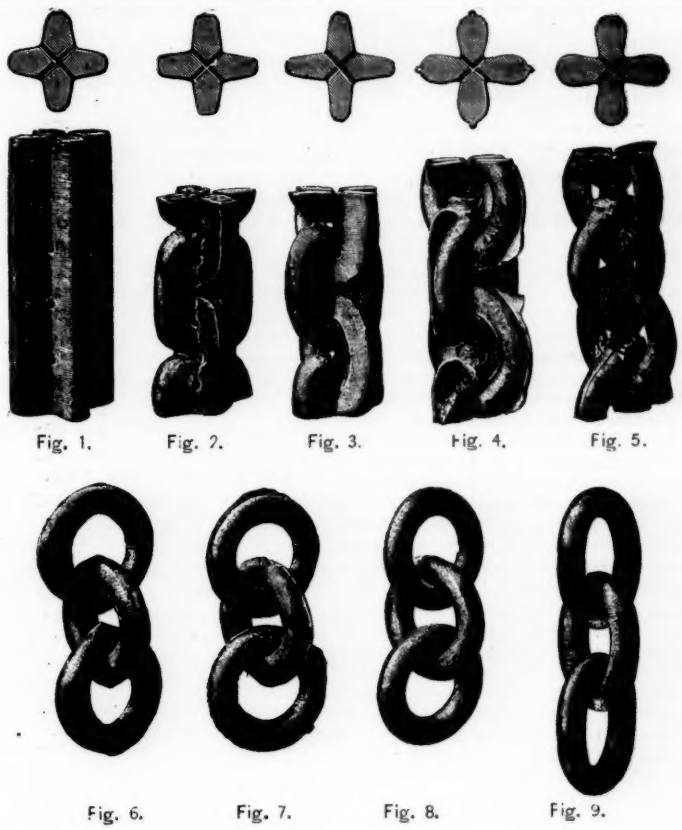


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Fig. 6. Fig. 7. Fig. 8. Fig. 9.

OURY'S WELDLESS STEEL CHAINS.

up, the results being shown in figs. 3 and 4. The partially worked blank is now ready for being punched through and parting, as indicated in fig. 5. The succeeding operations, illustrated by figs. 6 to 9, consist simply in cleaning and truing up the links to their final form. The makers claim that the chains are considerably stronger than those made in the usual way, and considering the number of welds in an ordinary chain, there seems considerable force in the contention.

Apart from the danger of defective welds, however, the new chain has a great advantage in being made of steel, while, on account of the difficulty of welding, iron is usually used in ordinary chains. Owing to this the new weldless steel chains are, it is claimed, for the same strength, not more than about two-thirds the weight of the equivalent iron chain. The new product has been tested by the Bureau Veritas with the above results.—*Engineering.*

Description of chain.	Total load.	Nominal stress per square inch.	Elongation of link.
	Lbs.	Tons.	Per cent.
Chain stud link, ⅛ in	17,127	24	30
" " ⅛ in	45,733	23.06	24
Chain ordinary link, ⅛ in.	25,300	23	29
" " "	46,479	23.5	28

TECHNICAL.

The Nicaragua Canal.

Although the force engaged on the Nicaragua Ship Canal has been somewhat reduced, a very satisfactory report of progress is made by the inspection party lately returned from Greytown. The pier has been extended to a length of 1,030 ft., and the dredging of the channels continues with only the interruption due to an unusually stormy season. It has been wrongly stated that the channel has been seriously reduced in depth by the prevailing storms. The fact is, that in making the channel the dredges make two cuts. In some cases the dredges have been forced to retreat to the harbor during a storm, leaving the work unfinished. The sand is then washed back from the unfinished part into the completed part of the channel, and while the total amount of excavation remains the same, it is necessary for the dredger to resume work at some distance from the point where it was dropped. No serious trouble has arisen as yet from the attacks of the teredo, but there is sufficient evidence that he is alive and at work, and consequently an effort will be made to fill in with stone the piling already driven before completing the breakwater, and no attempt will be made to excavate the channel to its full depth until after the breakwater has been finished. The piles used in this breakwater at Greytown Harbor are 55 ft. in length, of a wood similar to the North Carolina pine; it was thought at first that if these piles were treated with 12 lbs. of creosote per cu. ft. they would resist the attacks of the teredo until the stone filling had been placed; but so much delay has occurred in procuring stone that the piles are now being treated with 16 lbs. of creosote per cu. ft., and are being charred as well.

In the work on the canal proper, great progress has been made in the construction of railroad and telegraph lines and buildings. The excavation has been carried to a depth of 17 ft. for a distance of one-half mile, but the right of way has been cleared fully ten miles in advance of the excavation. All the cleared ground has been relieved of débris by burning, except for some large stumps which are being treated with dynamite and fire. The excavation so far has been through a rather even soil in which sand predominates, but the amount of clay encountered is increasing and borings indicate that the clay will soon predominate. As yet no buried logs whatever have been found. The materials for railroad construction have been supplied from this country almost entirely. The ties used are mostly creosoted pine from North Carolina, though on account of delay a considerable amount of cypress was procured for this purpose from New Orleans.

Mr. Menocal, the Chief Engineer of the work, is at present in New York, and will probably remain here some time, in order that he may secure a little rest after his constant attention to the canal for 20 months.

The White Star Cattle Steamer Nomadic.

A marked advance in the transportation of cattle has been devised in the construction of this fine vessel. Her outward appearance is fully equal to any of the regular trans-atlantic steamers. Her internal appearance gives rise to much surprise when the duty of the vessel is considered.

The Nomadic is a twin-screw steamer, of 5,750 gross tons capacity and a dead weight of 7,300 tons; she is 460 ft. long, 49 ft. beam and 35 ft. deep. There are three decks—a lower, main and upper deck. The hull is of steel throughout, the framing of the construction with frame and reverse frame alternately, spaced 30 ins. on centers. The plating is of steel, with overlapping butt joints. The beams are also of steel, and under each row there are three, channel-section, longitudinal ties extending the whole length of vessel. The shelter deck beams are of bulb-angle shape and the deck plating is made extra thick, with double-thickness metal amidships. The three decks upon which the cattle are housed are cemented over to form a flooring, within which connecting gutter-ways are sunk for drainage. Footholds for the animals are provided by running heavy wooden strips or battens lengthways with the vessel and crossways at fixed intervals to form square foot-holds for both front and hind feet of each animal. The cattle are separately stalled and free access is provided for attendants. Thorough ventilation is provided for and good breathing space is accorded each animal. In all, there is accommodation for over 1,200 head of cattle. Every portion of the vessel is thoroughly lighted by electricity.

The motive power for the vessel consists of two triple compound engines, each of which operates a manganese bronze propeller. 16 ft. in diameter. The cylinders are 22, 36 and 60 ins. in diameter, and have a stroke of 48 ins. At 65 revolutions each engine is calculated to develop some 1,700 horse-power. Steam for all purposes is supplied from four large boilers, two double-ended, each 17 ft. 6 ins. long and 13 ft. 6 ins. in diameter, and two single-ended, each 10 ft. 6 ins. long and 13 ft. in diameter. There are 18 furnaces in all, operated with natural draft, and a steam pressure of 170 pounds of steam is carried on the boilers.

Two 48-in. horizontal fans are used for supplying fresh air, and two high-speed centrifugal fans are provided for removing the vitiated air after use. At 250 revolutions per minute the horizontal fans are calculated to furnish 80,000 cu. ft. of fresh air per minute. Provision is made for a perfect control of the ventilation and of the admission and discharge of air at all times, especially in bad weather, while for ordinary conditions of weather portholes are provided on the main and upper decks, which may be opened to relieve the regular apparatus of much of its work.

The Philadelphia (Natural Gas) Company.

The annual report of the Philadelphia Company, of Pittsburgh, for March 31, 1891, shows that the company paid dividends to the amount of six per cent. upon the capital stock; invested $128,257.16 in meters and regulators; laid 68,385 ft. of new 36-in. riveted steel mains at a cost of $714,290.59, during the past year. A considerable sum was also expended in taking up and relaying the smaller mains which were in use during the period of high-pressures and are now available for extending the company's distributing system. The debt of the company is about $1,551,000, but if it were to sell such of its assets as could be made immediately available, it would leave only an indebtedness of $188,000. The company is considering the advisability of supplementing its natural gas supply by the manufacture of fuel gas.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The annual report of the Lake Shore shows an increase in gross earnings of $1,378,000, and an increase in net earnings of $5,000. It is part of the same story which other roads have to tell, only they are not all so fortunate as to have the net earnings come out as an increase instead of a decrease. As compared with the previous year, the tonnage increased from 10,021,000 to 11,531,000; the average haul increased from 185½ miles to 187; but the average receipts per ton mile fell from 0.664 cents to 0.626 cents. This last average is not unprecedentedly low for the Lake Shore; it was much lower (0.553 cents) in 1885, a little lower in 1881, and not far from the present figure in several other years. The number of passengers carried has increased from 4,414,000 in 1889 to 5,020,000 in 1890; but the average distance traveled has taken a curious drop from 50½ miles to 45, so that the passenger mileage has hardly increased at all, and the passenger earnings have slightly diminished. As has been the policy of the company during recent years, the charges to maintenance account have been liberal, so that the net earnings are probably a little higher than would appear on the face of the returns.

Governor Hill has signed the bill giving the New York State Railroad Commissioners authority to compel the lighting and ventilation of railroad tunnels in conformity with any plan they may prescribe, and it is now a law. The only qualification of the commissioners' power is a provision that the city authorities must approve any change which affects the street above the tunnel. The law was proposed and passed in response to sensational clamor concerning the Fourth Avenue tunnel in New York City, and has no more reason in it than there was in the demand for compulsory legislation; but as the commissioners, in their report on the collision of Feb. 20, were moderate in their recommendations concerning lighting and ventilating schemes, it is not probable that they will take any radical action under their new powers. The middle or double track passage in the tunnel referred to is mostly open cut, and even the fathers of the law would probably conclude to leave that portion as it is. The side (single track) passages may more properly be termed tunnels; but any effectual method of drawing the smoke and steam out of them would involve extensive disturbance of the street, which the property owners would probably object to. As for illuminating the tunnel, the commissioners are probably already satisfied of its uselessness as a measure of safety, and the experiment of lighting a portion of one of the side tunnels with incandescent electric lamps has been finished without showing any instructive facts that were not known before.

The meeting of the Western Traffic Association in New York last week shows good results chiefly in a negative sense. That is, it appears that matters are no worse than they were. Rate cutting west of Chicago is more conspicuous by its absence than it has been before for a long time, and whether it is the shadows of grand juries or the orders of presidents that cause this great calm, the presidents will naturally be allowed to take the credit. A press dispatch that was telegraphed all the way from Omaha to give the views of a government director of the Union Pacific on the results of the meeting could only say that "it would probably tend to stiffen the stock market:" but as that was one purpose of the meeting, if not of the Association, this may not unreasonably be supposed to fairly summarize the case. To use positive in place of negative terms, we may say that the presidents have reiterated their promise to establish joint agencies and have compelled the discharge of a rate cutter. "The plan for establishment of joint agencies is Mr. Gould's pet scheme." This is the oftenest quoted of the magic phrases that are supposed to have some mysterious psychological effect on Wall street men, and it has doubtless fulfilled its mission: but Mr. Gould, after all, probably knows as well as other people the difficulties surrounding the movement. The effect of Mr. Leeds' dismissal cannot yet be seen. He tells reporters that he is really and truly out in the cold world, but most people seem to think that the Missouri Pacific will not let him go to the almshouse for a few weeks yet. A Chicago member of the Association says that while this first conviction will doubtless be ameliorated, the next culprit may expect a genuine "bounce." Perhaps this is the most accurate view of the case.

In our issue of April 17 we outlined what seems likely to be the scope and form of the recommendations that will be made at the coming conventions as to the inspection and care of air-braked freight cars in interchange. A good deal bas been said lately concerning the best means of testing the brake equipment at interchange points. It is doubtful if it will often be found practicable to pipe yards at such points for testing air brakes on freight cars. Ordinarily the switching necessary to get the air-braked cars into position for testing would take so much time and involve so much movement as to make it impracticable. The cost and delay would be too great. Probably the quickest way of accomplishing the object will be to fit the switching engines with air-brake apparatus. Of course much testing can be done with the road engines also. It is quite practicable to require the parts to be cleaned and oiled within definite limits of time, and to have them inspected for these requirements; but to be sure that the work has been done they will have to be tested under air. However far we may trust the inspectors in the matter of cleaning and oiling, to determine the piston travel and the slack calls for the application of air in some way. There is one measure that will very much simplify this whole problem; that is, the general use of the M. C. B. standards for brake gear. The troublesome slack is mostly due to the wearing of pins, the elongation of pinholes and the bending of levers, all because the dimensions are too small and the bearing surfaces insufficient. The associations can do but little more in this direction officially, the standards having been fixed and adopted, but the members as individuals can bring useful pressure to bear upon their neighbors, and the committees can help along by calling attention to the evils and their remedies.

The accounts of English train accidents, which we publish about once in three months, and of which an installment appears in this issue, are really valuable contributions to the current history of the operating department of railroads, and even a single paragraph, picked out at random, is quite sure to prove profitable reading. Moreover, this information about English practice concerns just those branches of operation to which Englishmen have given more careful study than we have, and which they are, therefore, the best able to instruct us on. The officers of the Royal Engineers, who make the investigations forming the bulk of these reports, are not only experts as regards their training, but are also qualified by long experience to form correct judgments on the varied questions that come up; and they apparently consider every point with scrupulous care. All imaginable questions concerning practice with block and interlocking signals and the discipline of trainmen, as well as numerous points concerning track practice, wear of wheels and machinery, etc., come up in the course of two or three years and are treated, so far as the limitations of an outside investigator will permit, with great thoroughness. One of the most significant facts in the reports now printed is the large number of cases in which men worked too many hours on a stretch. This is a subject on which conclusive evidence is seldom to be had, and presumptive evidence should, therefore, be more closely studied. While many men make blunders when they are tired, it is hard to prove that weariness has actually had a specific effect in any particular case, and so the importance of having men "fresh and rested," while undeniable as a general proposition, is not always kept in mind. It is probably true that American roads do not habitually work their trainmen quite so long as seems to be the case on some English lines, but extra work on account of emergencies is perhaps more common here than there, and the fact that a large share of the mistakes reported were made by men who habitually work long hours should not be overlooked. As the supply of men increases in this country there is a natural tendency to work them longer hours, or to have them work undiminished hours, while making the duties more exacting, and this tendency is counteracted only by the efforts of the labor unions and the good judgment of superintendents. As the labor movements are often blind and unreasoning, and so are not calculated to produce the most desirable results in all cases, the responsibility for getting good work by avoiding excessive strain on the workmen still rests with the railroad manager.

It is universally held that a safety appliance should be put in use where the danger is greatest, and, conversely, that when money is scarce those places where conditions are favorable or where traffic is light should be first set down on the list of jobs to be postponed. But it is somewhat curious to see how commonly the rule is varied in practice: and one must conclude that sentiment or unscientific expediency often has a powerful influence in this matter. In reporting on a collision which happened at Leeds, England, Dec. 24 last, Major Marindin says that the forgetfulness of the signalman doubtless could have been prevented by a special locking device that was introduced on the London & Southwestern near Vauxhall after a very bad collision there in 1880. If English conditions are as much like those found here as they seem to be, the first question to ask is, why should Vauxhall need this protection more than a hundred other places? Are the train movements more numerous or the men more likely to be careless than at the other junctions of the same sort and size? In point of fact, the inspector doubtless finds that the special interlocking would have done more good at Leeds than at Vauxhall. It is true that on the face of the facts it would have had to wait 11 years before coming into play, but apparently it may be twice 11 at Vauxhall. Locking the stable after a horse has been stolen becomes a rational proceeding only when it is applied to all the stables that contain horses. Putting on interlocking signals and derailing switches at a drawbridge where a train has been engulfed may satisfy railroad commissioners, because they are compelled by their limitations to take narrow views sometimes, but there is no warrant for spending more money on the protection of this bridge than on that of others carrying similar traffic and exposed to like dangers, unless it be to hoodwink the public. It may be proper to provide luxurious cars or station buildings for a part of the patrons and make the rest put up with promises for a while until more pressing needs are met, but an appliance which both protects life and promotes economy is of a different nature. The manager who gets an appropriation for interlocking at a junction because the directors know that a passenger has been killed there is in duty bound to press those directors for authority to make similar improvements at the dozen or hundred other points that are waiting to kill their man.

Cost of the M. C. B. Coupler.

Every addition to authentic data of the cost of maintenance of the M. C. B. coupler is valuable. The figures published last week (p. 324) of the cost on some 14,000 cars on the Vanderbilt lines are a real addition to the available knowledge on this subject.

The cost of maintaining knuckles alone was given for the New York Central, the Lake Shore and the Chesapeake & Ohio for specified numbers of cars. This varies from 91 cents to $1.75 per car. The average, giving each item weight according to the number of cars, is $1.15 a car. We do not know just what the records represent—that is, whether they cover the cost of repairs made while the cars were away from the home line, or whether they cover knuckles used for foreign cars. The figure deduced is considerably higher than that drawn from the record of 124,441 couplers for one year, which was 38 cents a car, for knuckles only. That, however, did not include any worn-out knuckles. Probably the record of the Vanderbilt lines includes some worn-out knuckles, but we do not know how long the knuckles which were replaced had been in service. Last June we published

the records of the C., B. & Q. for 1,184 couplers for six months and for three months, the breakage in each case being equated to one year. We may therefore sum up all these records in a table showing the cost of maintaining knuckles, a car a year, and not including cost of maintaining drawbars:

124,441 Janney couplers	$0.38
1,184 C., B. & Q. couplers	0.44
1,184 C., B. & Q. couplers	1.10
27,660 Vanderbilt lines couplers	1.15

In the Vanderbilt record the cost per car of couplers complete is given only in the case of the Michigan Central; that is $1.48. We will make another table comparing this item:

124,441 Janney couplers	$0.70
1,184 C., B. & Q "	0.96
1,184 " "	2.24
Michigan Central "	1.48

The Vanderbilt lines' records give another item which is important to compare with the figures given above—that is, the cost of links and pins. This varies from $0.87 to $1.84 a car a year. The number of cars from which the record is drawn is given for each road except the Michigan Central. Taking the cars of that road as 13,000, the total reported on is 68,200 cars. Giving the cost of maintaining links and pins on each line weight according to the number of cars, we have as an average cost $1.49 a car a year. This will be seen to be a good deal more than the highest figure given above for the maintenance of knuckles alone, and higher than any, except one, of the figures for maintenance of the couplers complete. This is for links and pins alone. The cost of maintaining the Potter link-and-pin coupler complete on the C., B. & Q. was found to be $2.79 a car a year on 20,140 cars.

These figures do not settle the subject by any means. Almost every one who had looked into the matter candidly and thoroughly was already convinced that the cost of maintaining the M. C. B. coupler, against breakages alone, was less than that of the link-and-pin coupler. But the cost of wear was undetermined, and it still remains so. These last figures do not determine it, but they do increase the presumption that the final cost of maintaining the M. C. B. coupler, wear included, will be found to be less than that of the link-and-pin.

Electricity and Railroads Again.

A correspondent writes in another column regarding electric motors for railroad use. He asks if we have not lost sight of the reduction of wear and tear on railroad beds. It is true, as our correspondent states, that the demand for heavier engines is increasing and heavier rails and stronger bridges are required, but it is not clear how an electrical locomotive would greatly reduce this demand. Whatever be the locomotive, whether electrical or steam, it must have the same total weight and practically the same wheel base; hence, there is but one way in which an electrical locomotive would reduce the wear and tear on the roadbed, and that is by the reduction of the effect of the excess of counterbalance needed to counteract the effect of reciprocating parts of steam locomotives. With electrical locomotives there would be no reciprocating parts, and, therefore, no need of an excess of balance; but when the methods resulting from the recent investigations to determine means of reducing this excessive balance are generally introduced the remaining balance of the steam locomotive will have but little bad effect on rails and bridges as now laid and built. This will be further reduced by the present rapid introduction of heavier rails and heavier bridge floors.

The heavy express engines of the future will probably have six or more driving wheels, with reciprocating parts weighing only about one-half of those now used. This will result in a great reduction of the centrifugal pressure of the balance in each wheel on the rail, and there will remain but little, if any, advantage of the electric locomotive over the steam locomotive in this respect.

If, as our correspondent suggests, a motor were applied to each car, the tax on the road bed would, of course, be reduced; but, if he will take up the question of subdivided or concentrated motive power for a single train, when electricity is used, he will reach some interesting conclusions, which may change his opinions as to the value of a motor on each car. If, as stated by an enthusiastic speaker at a recent engineers' convention, an electric motor were as "simple as a grindstone," there would be but one conclusion; namely, that the subdivided power is the better. But any motor yet proposed is far from being a simple machine; it is not as complicated as a steam locomotive, but it has parts which deteriorate rapidly and require constant attention. The trucks, to carry such subdivided motors, would be complicated, cumbersome and difficult to repair. The modern car truck with its swing motion and complication of equalizers and springs, with its six wheels and six individual brake beams and levers, is difficult enough to keep in a safe condition. Add to these the parts necessary to make it an electric motor truck, and the result would be such a mass of details as to prohibit its use. To repair a single part would require the removal of many others. Practical mechanical conditions will limit the use of subdivided power for electric propulsion a long time, at least until the electric motor has become much simplified.

Then, again, there is the loss of economy. A large motor is more economical than a small one. One motor, under the direct supervision of an engineer would be kept in fairly good condition, while a dozen motors distributed throughout the train, none of which can be inspected readily and continually, while in operation, would not average a good economical condition, and insulation would become difficult.

It is not clear, moreover, how there would be much saving in total weight of train, as an electric motor is a heavy machine at the best. The combined weight of twelve motors would be considerably greater than one motor, which would do an equal amount of work, for two reasons: There would be an unnecessary duplication of parts: and large motors have considerably greater power in proportion to the total weight than small motors. Able electrical engineers have stated that the total train load, using a motor on each car, would be greater than if a single electric locomotive were used at the head of the train.

There is also the item of safety to be taken into consideration. It can hardly be disputed that the presence of a heavy mass at the front of a train is a protection to the rear. In a collision, the steam locomotive and its tender assist materially in reducing the effect on the train. Besides it is well considered by many that a train is safer when pulled at its head than when propelled at each car throughout its length.

Our correspondent says: "With the electric motor we should have unlimited speed." It is a mistake to assume that the speed of trains is now limited by the possible speed of the locomotive. The limitation is a matter of safety and economy. The conditions of the permanent way, including crossings, etc., prevent the utilization of the maximum speeds which locomotives can make. Given a reasonable train weight, the present locomotives can attain readily a speed at which it would be unsafe to run. What is needed is greater pulling power at ordinary speeds in order that without exceeding the present maximum, on down grades and at other favorable points, a higher average rate may be attained. With the present maximum, the average speed between terminals could be increased at least one-third by using more powerful, but not necessarily heavier, locomotives. Hence the value of the electric motor, resulting from its unlimited maximum speed, does not become apparent where high average speed is the desideratum.

The loss of energy by the rapid exhaust referred to by our correspondent has been fully considered in comparing the economy of the two types of locomotives, electric and steam. Loss of energy by back pressure affects the comparative economy of the steam locomotive, and to offset it there are many incidental losses due to the use of electrical power.

The Manhattan Railway Company has presented to the Rapid Transit Commissioners a plan for increasing the rapid transit facilities of the city of New York. The plan involves several new lines and also additional tracks and facilities for the existing lines. The new lines proposed are: From the City Hall station through Centre street, Canal street and Watts to West street, and along West street from the Battery to Fourteenth street. Also a line through Fourteenth to connect this new west side line with the Ninth and Sixth avenue tracks; also a line from the present Thirty-third street station of the Sixth avenue up Broadway to the Boulevard and Eleventh avenue and 187th street and Kingsbridge road to the Harlem River. It is also proposed to extend the road from 155th street, along the Harlem, to meet this westerly line at about 218th street. So far as we can tell it is designed to make all of the new structures for three tracks and to increase the number of tracks for the Third Avenue road. This plan is a very excellent one for the elevated roads, and, in some respects, for the public. It would give much needed accommodation for people arriving by the Brooklyn Bridge and ferries from Brooklyn, and for those arriving from Jersey City, who wish to go up town or who wish to go directly across the lower part of the city. It would undoubtedly increase the traffic of the elevated roads during the present light hours. A defect of the plan, however, is that it apparently would not relieve the most congested portions of the existing lines during their crowded hours. In the course of Mr. Gould's conversation with the Rapid Transit Commissioners, he put forth the following theory of the sanitary influence of the elevated roads. We believe that he has propounded this doctrine before, but presume that few people are familiar with it.

Mr. Gould—Our passengers per train mile last month ran down from 25 to 23

Mr. Spencer—The total number of passengers did not decrease; it increased.

Mr. Gould—During the "grip" we fell off about $3,000 or $4,000 a day.

The Chairman—The Third Avenue, I presume, as yet carries the most passengers?

Mr. Gould—Yes. I guess the "grip" is about the only disease that the elevated road does not cure. It cures fevers. The passing of the trains creates tidal waves of atmosphere. A moving train creates a circulation and forces the bad atmosphere, which stagnates in the crevices, out and the air gets mixed. It is like the tides. There is no doubt that trains moving in the air are one of the great agencies of health in this city.

Chapters 563, 564 and 565 of the laws of New York, embodying the revision of the corporation and railroad laws of the state, which were passed in 1890 to go into effect May 1, 1891, appear to be now in force, the bills before this year's legislature modifying them having failed to become laws. It will be remembered that the State Railroad Commissioners, in their annual report issued last January, revised the summary of railroad laws, which is regularly printed, to conform to the changes which had been made by the commissioners of revision and which had gone into effect; but they took no action concerning the above-mentioned chapters because of this possibility that they might be modified. We are not sure but some action of the Governor, on bills now in his hands, may yet change the status of the laws, but there seems to be no doubt that the revised railroad law (Chapter 565) is now, and has been since the first of this month, in force. The commissioners say that "there will be a complete and radical change in the arrangement of the laws," and some changes in their matter. What these changes in substance are has not been published, but we learn from a reliable source that one of the sections which is now in force is that providing means for giving legal effect to the recommendations of the Board of Railroad Commissioners. This section will be of interest to all railroads. It reads as follows:

§ 162. *Legal Effect of Recommendations and Action of the Board.*—No examination, request or advice of the board, nor any investigation or report made by it, shall have the effect to impair in any manner or degree the legal rights, duties or obligations of any railroad corporation, or its legal liabilities for the consequence of its acts, or of the neglect or mismanagement of any of its agents or employés. The Supreme Court at special term shall have power in its discretion in all cases of decisions and recommendations by the board which are just and reasonable to compel compliance therewith by mandamus, subject to appeal to the general term and the Court of Appeals, and upon such appeal to the general term and the Court of Appeals may review and reverse upon the facts as well as the law.

It will be seen that while it is still necessary that a decision of the commissioners must be "just and reasonable" before compliance with it can be compelled, there is apparently a definite intention of throwing the burden of proof, in doubtful cases, more decidedly upon the railroad companies.

The Railroad Commissioners of North Carolina have decided to order a reduction of passenger rates on roads within their jurisdiction, but the date is not June 1, as heretofore reported. The changes are as follows: First-class fares are to be reduced 2½ mills per mile—that is, from 3½ cents to 3¼ cents, or 7½ per cent.; second-class fares from 3 cents to 2¾ cents per mile, or 8½ per cent. Before these rates go into effect the railroads are given till July 1 to make appeals, after which the rates shall stand as revised and promulgated by the commission as being fair and reasonable within the meaning of the law. It is not believed that the railroads will make much ado about so moderate a change. While on many smaller roads and branch lines the passenger traffic does not pay, still on these very roads the freight traffic pays handsomely. North Carolina gets comparatively little benefit from low through rates on account of the lack of any great distributing centres in her railroad system; much of her Western and nearly all of her Northern import rates are fixed with reference to those in force to adjacent traffic centres. The great struggle with the railroads will come when the commissioners take up the revision of the freight tariff. Sleeping-car fares are also to be looked into, and it is probable that the commission will in some cases order reductions to the extent of 50 per cent. The telegraph companies have been ordered to cease discriminating against small towns in favor of large ones. Correspondence has been had with the railroads looking to improvement of the through-passenger train service between points in the western parts of the State and seaports. The first efforts of the commission are generally considered to be conservative, in spite of alarming cries to the contrary.

Forest fires have done extensive damage during the past week in Michigan, northern Wisconsin and Pennsylvania. Press dispatches report losses varying from $25,000 to $100,000 at dozens of places; but the reports are thus far greatly lacking in definite particulars, and it is not possible to estimate the actual amount of destruction, though it seems certain that many small villages and a large number of saw-mills have been destroyed. A number of reports specify scores and even hundreds of people as made homeless. Michigan reports come from Isabella, Mecosta, Midland, Gladwin and Clare counties; from Alcona county, from Escanaba,

Ishpeming and a dozen other points. Smoke is so dense over all the northern part of the state that there is great discomfort, and navigation on the lakes is impeded the same as by fog. The Toledo, Ann Arbor & Northern Michigan road has been obliged to abandon all attempts to run trains north of the Clare county line. A freight train and crew had a narrow escape from death, the ties being so badly burned that the rails spread when the train went over. Reports from Ashland, Wis., tell of large losses of lumber and other property.

In Pennsylvania a serious disaster occurred on Sunday. At Moore's Run, on the Sinnemahoning Valley road, a gang of 75 men with a work train sent out to fight the fire was surrounded, and attempted to escape by running past a large pile of burning logs. But the rails had been thrown out of line by the heat, and the train was derailed as in a furnace, and seven men, including Mr. W. H. Badger, Superintendent of the road, were burned to death. Many more were badly burned and a number of the injuries will prove fatal.

A singular car-lighting accident happened recently on the line of the Central of Georgia. A passenger car in a moving train took fire and was entirely consumed. The train is said to have been going about 35 miles an hour when the car caught fire, but was stopped and the car cut out and allowed to burn. Then the trucks were cleared away and the train coupled up again, and the journey was resumed. The car was lighted by the Frost, dry carbureter system. From such particulars as we can gather it appears that the air pressure was left on while a lamp was not lighted, and the lamp globe was filled with the heavy gasoline vapor. When the porter undertook to light the lamp there was an explosion of gas, which set fire to the car. The Central has decided to "dispense with the use of the Frost system," and will make a trial of the Pintsch system instead. Without a knowledge of the material facts it is useless to speculate as to the precise cause of this accident.

On May 1 an accident happened on the London, Brighton & South Coast Railway at Norwood Junction which came near being a great disaster. An express train carrying about 200 persons was derailed while running at from 35 to 40 miles an hour, but no one was killed, and but half a dozen injured. The derailment was caused by the failure of a bridge over a street. The General Manager writes to a London journal, saying that the bridge fell in consequence of "a latent flaw in one of the girders." A press dispatch says that the bridge had been "reported inadequate for traffic," and that the company had entered into an agreement to build a new one. All of the wheels of the train of 11 coaches left the rails and ran about 100 yards on the ballast. None of the vehicles were overturned, however.

Up to Wednesday morning, between 150 and 160 members of the American Society of Civil Engineers had sent in notice that they would attend the convention. This insures a probable attendance of over 200. No change has been made in the arrangements except that the Farmers' Alliance has secured the steamboat which was to have been used for the excursion on the Tennessee, Saturday, May 23, so that the excursion will be made on Friday, and the business meeting will be held on Saturday. The local committee wish attention called to the fact that though Lookout Mountain is in the South its altitude is such that overcoats are often comfortable in the evening and early morning.

The May crop report of the Department of Agriculture repeats the favorable condition of the April report. The general average of wheat is 97.9, which is the best May average, with one exception, that the Department has ever reported. The returns from different states show striking uniformity. The condition of winter rye is also reported as 97, a very high average. The grass crop is equally promising; but spring plowing has been a good deal retarded by excessive moisture. The cotton crop is late. The report of the Department upon the injury to fruit by the May frost is not complete enough to be instructive.

TRADE CATALOGUES.

Illustrated Catalogue of Root's Positive Blast Blowers. The P. H. & S. F. Roots Co., Connersville, Ind. January, 1891.

This catalogue gives a general description of Root's new power blower, with illustrations of various styles of blowers and considerable general and special information about them. Several applications for different purposes are described. One of them is the use of the blower for handling slack coal at mines. By a blast the slack can be very conveniently carried to any desired dumping place. Several recent improvements have been made in order to get a positive feed of the slack to the blast. This has now been accomplished, and the company is prepared to put in slack removing plants under this system.

An improved journal box and bearing are illustrated. The journal box is bored with a taper hole, and the phosphor-bronze bearing is taper on its outside to fit this. The bearing is then slotted on the top throughout its whole length. By means of set screws the bearing may be drawn into the box as wear is developed, thus keeping the journal centre in its original position, a very important matter in a blower.

The Beals Brake. Beals Railway Brake Co., 53 Broadway, New York.

The company has published in a small pamphlet a paper read before the New York Railroad Club in November, 1888, by Mr. James Howard, on "Train Brakes and the Mechanical Principles which Control their Construction." Many of our readers will doubtless remember this paper, which was published at considerable length in the *Railroad Gazette* at the time. Its principal objects are to show the superior efficiency of the squeeze brake and to develop the theory of the momentum brake.

The pamphlet contains, in addition, a description of the Beals driver brake, with directions for operating it, testimonials from those who have used it, and certain data and formulæ on brake resistance, train resistance, brake stops, etc.

TECHNICAL.

Manufacturing and Business.

The Fontaine Crossing Co. has established works at Detroit, Mich., and is now in position to offer the crossing to railroads. It is designed to be connected with any kind of target, and also to be coupled with an interlocking machine. The mechanism of the crossing has been somewhat simplified, and it is made of steel in a simple and substantial form. Heretofore it has been difficult and tedious to procure parts for repairs, which has been one of the reasons why this crossing has not been more extensively adopted, probably the main reason. The company is also in a position to contract for electrical work and manufactures a dynamo of its own.

The Illinois Central has purchased a license from the American Continuous Drawbar Co., of Aurora, Ind., to equip its cars with the American continuous draft rigging, which has been given an extensive trial on 1,000 cars of the road. The draft rigging has been recently put upon the following cars: 500 Gardner stock cars and 300 Swift refrigerator cars built by the Michigan Car Co.; 500 cars for the Baltimore & Ohio and 300 for the Baltimore & Ohio Southwestern, built by the South Baltimore Car Works; 76 Union Refrigerator Transit; 100 Louisville, Evansville & St. Louis, 100 Cincinnati, Wabash & Michigan, and 200 Evansville & Terre Haute cars, built by the Terre Haute Car & Mfg. Co.; 25 cars for the East St. Louis & Carondelet, 200 for St. Louis, Alton & Terre Haute, and 111 for the Baltimore & Ohio, built by the Litchfield Car & Machine Co.; 200 for the Choctaw Coal & Railway Co., built by the Kansas City Car & Wheel Co.; 1,000 for the Baltimore & Ohio, built by the Pullman Car Co.; 200 for the Mexican Northern, built by the St. Charles Car Co.; 2,000 for the Illinois Central, built by the Wells & French Co.; 1,600 for the Missouri Kansas & Texas, and 600 for Street's Stable Car Line, built by the Missouri Car & Foundry Co.

The Mason Regulator Co., of Boston, has acquired the exclusive right to manufacture and sell the piston throw indicator for air brakes, patented by Mr. Frank Robinson, of Bangor, Me., the Master Mechanic of the Maine Central. This device is perfectly simple and indicates at any time to a car inspector the condition of the piston of the air brakes. The Mason Regulator Co. will soon issue a catalogue and description of the indicator.

Lucien Barnes and Charles O. Barnes, of Syracuse, N. Y., have placed an order with Pratt & Letchworth's Malleable Iron Works at Black Rock, near Buffalo, for a number of couplers to be known as the "Barnes No. 4" type. In this new coupler Mr. Barnes combines some of his recent patents which provide against the dropping of the drawbar to the track.

The Canadian Bridge & Iron Co.'s new building at Montreal, to replace the one burned last December, has been filled with new machinery and reopened. It is 100 ft. square, covered with sheet iron.

Carl F. Boynes, for many years in the employ of the Pennsylvania Railroad at the roundhouse at Hollidaysburg, Pa., has invented a metallic crosstie.

The Johnson Railroad Signal Co. has removed its New York offices to 47 Broadway.

Dr. William L. Breyfogle, ex-President of the Louisville, New Albany & Chicago, Monon, has bought the New Albany Forge Rolling Mill at New Albany, Ind., for about $100,000.

The F. C. Austin Manufacturing Company, of Chicago, Ill., has resumed business after a temporary closing of the works. During this period the works have been thoroughly repaired and $100,000 has been added to the working capital to allow for extensions.

The executors of the estate of G. R. Campbell, President of the Campbell Frog & Crossing Works, of Bucyrus, O., propose to sell the shops and the patent rights of the company for the Campbell steel frog and the other track devices controlled by the company.

Iron and Steel.

The Leechburg Foundry & Machine Co., of Pittsburgh, has received an order to build a 23-in. sheet and cold rolling mill for the Irondale Rolling Mill. The company has also several large contracts on hand for mills and hydraulic work.

J. M. Risher, assignee of L. D. Risher, has closed the sale of a manufacturing site to Robert O. Carter. This site is for the proposed iron mill at Hays Station, Pa., which is to be conducted by the workingmen, who have formed a corporation, with $100,000 as the capital stock. They will build a rolling mill, with a finishing department, employing together about 200 hands.

The trustees of the Crown & Cumberland Steel Co. have sold its plant and machinery, located in South Cumberland, Md., to the firm of Hicks & Dickey, Philadelphia, for $38,600. It is understood that the purchasers expect to operate the works as soon as the sale is ratified.

At an annual meeting of the stockholders of the North Carolina Steel & Iron Co., held recently at Greensboro, N. C., the directors were authorized to levy an assessment of 15 per cent. on the stock subscribed. The following were elected directors for the coming year: S. H. Wiley, of Salisbury; J. A. Odell, T. Worth, S. S. Brown, D. W. C. Benbow and R. T. Gray, of Raleigh.

Work will begin at an early date on the construction of an iron furnace at Front Royal, Va., by the Twin City Iron Co.

The Fischer Foundry & Machine Co., of Pittsburgh, has recently added to its machine-shop equipment, among other tools, a 16-ft. boring mill, 12-ft. planer, 48-in. horizontal boring machine and a 72-in. radial drill press. The company has also put in a 20-ton traveling crane of its own construction. There have just been completed at these works two 10-ton traveling cranes for the Pennsylvania Tube Co., and a 20-ton traveling crane for foundry practice is now in course of construction.

The Lehigh Rolling Mill, which has not been in operation for two years, is being refitted, and will start up soon. All the puddling furnaces are being rebuilt, and two new engines, built by the Atlas Engine Works, of Indianapolis, Ind., put in. It is intended to make spikes, and when all the repairs are made the mill will be used exclusively as a puddle and spike mill.

The furnace and fuel gas producer plant designed and erected by the S. R. Smythe & Laughlin Co. for the Pennsylvania Tube Works is now in successful operation. The tube works management has already contracted for additional furnaces and gas producers.

The Globe Iron Roofing & Corrugating Co. will remove its plant from Cincinnati, Ohio, to Newport, Ky., having purchased the Newport Iron and Steel Works.

The Carpenter Steel Works, of Reading, Pa., have received an order from the government for six-inch steel projectiles, amounting to $200,000. These projectiles were recently tested at Annapolis, Md.

The Ellis & Lessig Steel & Iron Co., Ltd., of Pottstown, Pa., has decided to rebuild its plant at Pottstown, and not to remove to Salem, Va., as the company recently proposed to do.

Swift's Iron and Steel Works, located at Newport, Ky., and lately purchased by the Cincinnati Corrugated Iron & Steel Co., will commence operations some time in May.

D. R. Lean, of Pittsburgh, Pa., has just completed a 10-ton open-hearth steel furnace for Norton Brothers, Maywood, Ill.; one 10-ton open-hearth furnace for St. Louis Steel Foundry Co., East St. Louis, Ill.

The Totten & Hogg Iron & Steel Foundry Co., of Pittsburgh, has contracted to furnish to the Minneapolis Rolling Mill Co. an 18-in. three-high muck train of modern design.

New Machine Shops and Stations.

The Texarkana Car & Foundry Co. will rebuild its car and machine shops at Texarkana, Tex., recently burned, on a larger plan.

The Norfolk & Western will, it is stated, erect a station in Shenandoah, Va., at a cost of $25,000.

The Chesapeake & Ohio has purchased nearly $50,000 worth of new machinery for use in its Clifton Forge machine shops.

The brick round-house to be built by the Pittsburgh & Western at New Castle Junction, Pa., will have a capacity for 40 locomotives. Work on it has been commenced.

The New York, Lake Erie & Western proposes to build a large round-house and make other improvements about its shops in Bradford, Pa. The round-house will be built on the site of the present warehouses.

Plans and specifications of the roundhouse and shops of the Houston & Texas Central to be built at Ennis, Tex., have been completed. The grading of the grounds has been commenced.

The Toledo, St. Louis & Kansas City is erecting new shops at Frankfort, Ind. It is expected they will be completed and equipped with machinery by July. The buildings are of brick, resting on stone foundations, and will have slate roofs. A roundhouse, which will hold 12 locomotives, is already completed.

The Pittsburgh, Wheeling & Kentucky has plans prepared for a new station to cost $40,000, at Wheeling, W. Va. The plans contemplate a complete change in the track arrangements, and the occupancy of a part of the public wharf at that point. The building will be two stories high.

The Leak in the Coffer-Dam at the Sault Ste. Marie.

The leak in the coffer-dam for the new lock at the Soo has been repaired and for the present any danger to the traffic between Lake Superior and the lakes below it is averted. General Poe describes the circumstance of the leak and the methods taken to stop it in a letter to the *Marine Review*, from which the following is condensed:

The new lock is to occupy the position of the two locks built in 1855, and is consequently alongside the lock now in use. The coffer-dam is a clay wall starting 22½ ft. below the surface of the water in the canal, with a minimum width of eight feet, which is confined between two timber cribs filled with stone. The leak was caused by the water blowing through a vertical rock crevice which was four feet below the bottom of the cribs and about nine feet lower than the surface of the water in the river below the lock. At one time the leak was so large that bales of hay were drawn through it, but the cribs were not upset. Twelve by 12 sheet piling was driven down to the rock and the gap filled with some 2,000 sacks of clay and loose clay, which was then loaded with rock and the wall so compressed that the pumps, 19 days after the break occurred, cleared the pit from water.

To stop the leak entirely soundings were made through the clay wall some 30 feet and the crevice located. An iron pipe was then put down, which was filled with clay, and an iron rod driven by a pile driver was used as a piston to ram the clay into the crevice. This operation was repeated until the clay so rammed forced the puddle wall upward and the leak was staunched. As soon as the ice could be cleared from the canal, which was after the leak was stopped, the movable dam was put in place and the water in the canal below it was drawn off through the lock. When the upward pressure of the water was taken off, the new portion of the puddle wall, which was 30 feet high, compressed as much as 18 inches. After this experience General Poe regards the dam better than it was before and hopes to control any break which may occur in the future.

The Gibbs Coupler.

Concerning the Gibbs steam hose coupling, which was shown and described in the *Railroad Gazette*, April 3, we have opinions from the officers of the car departments of several roads. Inasmuch as they are in each case the result of use, it seems fair to publish them. We should be glad to have the results of trial of other devices.

Mr. E. W. Grieves, Master Car Builder, Baltimore & Ohio, says: "The Gibbs steam couplers, since having been improved, have been working with satisfaction, and I do not think we have any other improvements to suggest." Mr. C. H. Cory, Superintendent of Motive Power, Cincinnati, Hamilton & Dayton, says: "As regards the Gibbs coupler, which we have had in use during the past year for car-heating purposes on our trains

running between Cincinnati and Chicago, I find it to be very efficient in all its parts. We have yet to find the first one that has given out and caused us any trouble during the past winter's use. The joints in all appear to remain perfectly tight. The coupler, being simple in its construction, is easily handled by our train hands, and in no way liable to give out or get out of order or cause repairs to be made." Mr. F. P. Boatman, Superintendent of Machinery, C., C., C. & St. L., says: "The Gibbs coupler is good and satisfactory; have had it in use on the Ohio & Mississippi two winters, and never knew one to leak." Mr. W. L. Hoffecker, Superintendent of Motive Power, Central Railroad of New Jersey, says: "I am satisfied that we have made no mistake in selecting the Gibbs coupler for steam heat on our passenger cars. We have had it in service for the past two winters, and it has been giving entire satisfaction. Our employés all like the Gibbs coupler, the operation being similar to that of the Westinghouse air-brake coupler, requiring no special instructions for the trainmen to operate." Mr. L. B. Paxson, Superintendent of Motive Power and Rolling Equipment, Philadelphia & Reading, says of the Gibbs coupler: "As far as the maintenance of the couplers under the tenders of our engines which come under my immediate notice, they have worked very well indeed; and I would further state that in the few trips that I have made upon the Blue Line I have only noticed one of them leaking this winter." Mr. J. S. Merrill, Superintendent Pullman Palace Car Co., says: "This coupler has been in use on the cars of this company operated over the Jersey Central, Philadelphia & Reading and Baltimore & Ohio lines between New York and Washington, also on the Baltimore & Ohio Southwestern and Ohio & Mississippi railroads on cars running in through lines between New York, Cincinnati and St. Louis for the past two seasons. It has given entire satisfaction. The simplicity of its construction and the ease with which it may be coupled or uncoupled on the same principle as the Westinghouse air-brake coupler especially commend it to trainmen. Mr. Wm. Garstang, Superintendent Motive Power, Chesapeake & Ohio Railway, says: "The Gibbs and the Sewall, to my notion, are the two best couplers that are now in the market." Similar opinions might be quoted from several other roads.

The Lockport Water-Power Canal.

The preliminary surveys for the water-power canal from the Niagara River at Tonawanda to Lockport, and thence to Olcott, twelve miles north of Lockport, empty ing into Lake Ontario, were begun May 12. They are in charge of Charles B. Brush, of New York. By this canal a water power of between two and three hundred thousand horse-power can be delivered.

Pipe Joint Grease.

Mr. David Brown, Master Mechanic of the Delaware, Lackawanna & Western Railroad, has been experimenting with the Joseph Dixon Crucible Company's pipe joint grease on the mud plugs in his locomotive boilers, and says the plugs come out easy and when taken out are clean, and that he will use the compound hereafter.

Patent Infringements Suit.

D. Saunders & Sons, of Yonkers, N. Y., have brought suit in the United States Circuit Court at New York against manufacturers who, they claim, are infringing their re-issued patent No. 10,021, dated Jan. 31, 1882, for improvements in pipe-cutting instruments. The firm is the assignee of the inventor, Andrew Saunders.

Electric Forging.

The Electric Forging Co., of Boston, Mass., issues a circular containing a paper by Mr. Geo. D. Burton, the inventor of their system of forging, read before the Franklin Institute. In this paper is described the Electric Forging Co.'s method of forging spikes, bolts, shoe calks, wrench screws, anti-friction rolls, balls, knife blades, "and a great variety of like and unlike articles." They claim great advantages for the electric forging, due to an even heat, the heat being constant during the hammering, and several other features advantageous to the manufacture of small ironwork.

Morden Frog and Crossing Works—A Correction.

In the *Railroad Gazette* of May 1 appeared an item describing the Morden Frog and Crossing Works, of Chicago, Ill., wherein it was stated that they employed 150 men and that the output was 1,100 frogs and switches per year and from 80 to 100 crossings per year. This should have read 350 men and 1,100 frogs and switches and from 80 to 100 crossings *per month*.

Cattleguard Litigation.

In the recent litigation between the National Surface Guard Co. and Parker Merrill as to the four-section, interchangeable cattleguards, the National Surface Guard Co. has been successful on all points and has been allowed patents giving it the exclusive right to make cattleguards with four interchangeable sections.

The Shay Locomotive.

We have received the following additional particulars of the weight of the Shay locomotive, built for the Montana Union Railroad by the Lima Machine Works, which was shown in our issue of May 8. With two gauges of water in the boiler, the weight on the front truck is 66,000 lbs. With two gauges of water in the boiler and 6,000 lbs. of coal in the tender, the weight on the middle truck is 58,500 lbs., and with the tank two-thirds full of water, the weight on the rear truck is 51,500 lbs. That is, under these conditions the total weight on drivers is 176,000 lbs.

An Italian Railroad Disaster.

A press dispatch of May 8 reports a great disaster at Allerona, near Orvieto, in the providence of Umbria. While a quarry train, on which were many workmen, was at Allerona, a sudden flood occurred in the river, and the rushing water sweeping over its banks engulfed the train, carrying it a considerable distance. Most of the men on board were drowned before any assistance could be rendered them.

A Tunnel Suit.

DeWitt C. Haskin, who is building the tunnel under the Hudson River at New York, has brought suit against the St. Clair Tunnel Co and the Grand Trunk Railway, placing damages at $300,000. He claims that the tunnel at Port Huron is an infringement of tunnel patents held by him.

A Sand Dryer.

Mr. J. McDonald, of the Japanese imperial railroads, has designed a sand-drying device which is meant to avoid the necessity of drying the sand before it enters the locomotive sand box, unless it be very wet. The chief feature of his device is a circular steam passage around the sand pipe just where the latter leaves the box. This is piped for live steam and a drip cock is provided so that the water of condensation can escape. In this way the sand is thoroughly dried, the greatest effect always being produced upon that portion of the sand which will be used first. The device has been used for some time in a damp climate without a single failure to do its work. In that case it was applied to sand boxes located within the wheel guard.

Berne's Audible Signal.

This signal consists of a bell to be placed in the cab of a locomotive, to be operated by a battery located near it, the circuit being closed by a connection, through metallic contacts placed between the rails, with wires extending to switches, drawbridges, ends of block sections or other points of danger along the line. There is no battery except on the engine. A miniature engine with full size bell is now on exhibition at 222 East Fourteenth street, New York City. The connection between the electric wires on the locomotive and those extending along the line is effected by means of a metallic brush so hung as to come in contact with substantial iron plates fastened to the sleepers between the rails. This signal has been tested on the track of the Illinois Central at New Orleans, and its record is well spoken of by the Superintendent of the division on which it was tried. The proprietor of the device is the Electrical Safety Switch Co., Limited, of New Orleans, and it is shown in New York by Mr. A. W. Berne.

Contracts for Harbor Work.

Sealed tenders for deepening the channels leading into Hamilton Harbor, Bermuda, will be received at the office of the Colonial Secretary, Hamilton, Bermuda, up to July 14. Complete plans of the work may be seen, and specifications and information regarding the work may be obtained at the office of the British Consul in New York City.

THE SCRAP HEAP.

Notes.

The Baltimore & Ohio has begun suit against the Kensington Land Company, of Chattanooga, Tenn., to recover $11,025 alleged to be due for passengers transported over the road.

The passenger who had with him 25 lbs. of dynamite in a Boston & Albany passenger train which was wrecked last month has been arrested at the instance of the railroad company.

Strikers on the Midland of Indiana are still interfering with the passage of trains, and it is reported that the trouble is extending. The dispatches continue to state that the men's pay is six months in arrears.

The Gulf, Colorado & Santa Fé repair shops at Galveston, Tex., were burned last Friday, with four locomotives, five cars loaded with oil, two with lumber, one baggage and six passenger cars, besides all tools belonging to the workmen.

A newspayer item says, on the authority of Mr. Arthur, that the Brotherhood of Locomotive Engineers has expelled 375 members during the past year because they were dissipated; and Mr. Arthur states that the organization always notifies the employer in such cases.

The Collector of Customs at Burlington, Vt., has received a letter from the Secretary of the Treasury, in which it is held that the employment of trainmen and gangs of laborers on work trains, etc., in work which requires them to pass to and from Canada, does not come within the prohibition of the alien contract labor law. The Secretary says: "Congress does not appear to have intended that the Alien Contract Labor law should disturb the intimate business relations existing along the border, further than to check actual importations of aliens under contract to perform labor in competition with American workmen."

Brooklyn Bridge.

The monthly meeting of the Trustees of the New York and Brooklyn Bridge was held May 11. It was resolved to make the bridge promenade free on the 1st day of June. The plan for an avenue of approach at the Brooklyn end of the bridge, recommended by the board of experts, was adopted.

Bids for iron and steel and lumber to be used in the building of the Brooklyn avenue of approach were referred to the Finance Committee for compilation and report.

The cash receipts for April were $99,797.40 from promenade, carriageway and railroad, and $18,972.48 from rent and material sold. The expenditures were $322,936.75. The total number of persons crossing the bridge during April was 3,653,328.

American and English Pig Iron Production.

Sir James Kitson, the President of the British Iron and Steel Institute, who visited this country last fall, has an article in the May *Contemporary Review* on our industries, in which he states that the British pig iron production of last year was 7,875,000 tons, as against a production of 9,202,000 tons in this country. It was expected that the English production would not exceed, if it equaled, eight million tons, but few were prepared to see a difference of 1,327,000 tons.

These figures are very significant in view of the production of the two countries in 1867 and 1868, which was as below:

Year.	American production.	British production.
1867	1,305,023	4,761,023
1868	1,431,250	4,970,206

That is to say, our excess over the production of the United Kingdom for last year was greater than our total make in any year previous to 1868, and the average price of pig iron, which in 1867 was $44.12 and in '68 was $39.25, has been between $17 and $20 for the past three years. Concurrently with our increased production of pig iron and its decreased cost there has been a great increase in our foreign commerce. For the two years 1867-8 the average value of our exports of domestic merchandise was $274,588,355, and of our imports $376 598,768, whereas last year the figures were for exports $845,293,828, and for imports $789,310,409. In fact, our exports of domestic merchandise last year to Great Britain and Ireland were valued at $444,459,009, and our imports from the same was $186,488,956, or within four per cent. of our exports and imports of 23 years ago.

In speaking of the Baldwin Locomotive Works which he visited, Sir James makes the following remarkable statement for a locomotive builder: "The Baldwin Locomotive Works, of Jones, Parry & Co. [*sic*], in Philadelphia, turn out engines at the rate of 700 or 800 per annum. These engines are, however, of one class, whereas in England distinct types are called for by different railways, and this consequently restricts the output in this country."

One must be a pretty able classifier who would put a saddle-tank switching engine on four drivers with a compound consolidation freight locomotive, or assert that standard and narrow gauge locomotives are of the same type for manufacturing purposes.

The paper, which is a very interesting one, concludes with the remark: "When America forgoes her system of protection, which cramps her development and limits her intercourse with foreign nations, it is certain that her increased prosperity will have a favorable effect on the industries of this country."

Ventilation of Fruit Cars.

A carload of Carolina strawberries has just been received by freight in Philadelphia in one of Pancoast's ventilator cars. We are informed that the strawberries arrived in drier and sounder condition than any other shipment this season from any locality, even than those coming by express. This load was of the last picking and therefore especially perishable, and the result is looked upon on that account as being particularly good.

The Westinghouse Electric Co.

A syndicate, consisting of August Belmont & Co., of New York; Lee, Higginson & Co., of Boston, and Brayton Ives, President of the Western National Bank, of New York, has been formed to undertake the reorganization of the Westinghouse Electric Mfg. Co. and its associated interests. This syndicate, together with certain creditors of the company and others, has agreed to take $3,000,000 of seven per cent. preferred stock upon the assent of the stockholders to the plan of reorganization. Messrs. August Belmont, Marcellus Hartley, Henry B. Hyde and Brayton Ives, of New York, and Charles Francis Adams and Charles Fairchild, of Boston, have consented to become directors. According to the plan the holders of the $7,000,000 common stock outstanding are to surrender into the treasury 40 per cent. of their holdings, which, with the $3,000,000 issued but not sold, will make about $6,000,000 of treasury stock. Of this $4,000,000 is to be converted into seven per cent. stock, of which the $3,000,000 specified above is to be issued to provide for the floating debt and provide working capital, and $500,000 is to be held in the treasury to provide further capital when needed. A part of the remaining treasury stock is to be used to purchase further stock in the United States Electric Lighting Co. and the Consolidated Electric Light Co., in both of which companies the Westinghouse Co. is already extensively interested.

LOCOMOTIVE BUILDING.

The Rhode Island Locomotive Works have received an order for six compound locomotives to be built for the Mexican Central.

The New York, Lake Erie & Western is receiving five 50-ton six-wheel switching engines from the Cooke Locomotive Works. They are all equipped with fire pumps, and will be put in service on the Chicago and Erie division. The company will shortly receive from the Baldwin Locomotive Works the 20 ten-wheel engines ordered last year, which are to be used for both freight and heavy passenger work.

The Denver & Rio Grande has received two heavy passenger engines from the Baldwin Locomotive Works. Eleven new engines of this type have been delivered by the firm within a year. They are for heavy mountain work. Besides the passenger engines, 20 consolidation freight engines were ordered, and the first of the number will be delivered soon.

CAR BUILDING.

The St. Charles Car Co. has recently built 17 chair cars for the Missouri, Kansas & Texas.

The Baltimore & Ohio has let a contract for new passenger cars to Pullman's Palace Car Co. The number is said to be 40.

The Cleveland, Cincinnati, Chicago & St. Louis has let a contract for 1,200 freight cars to the Missouri Car and Foundry Co. of St. Louis. The order includes 200 refrigerator cars, 500 box and 500 platform cars.

The Alabama Great Southern this week received 20 new ventilated fruit cars from the Elliott Car Works, at Gadsden, Ala.

The Ohio Falls Car Co. has closed a contract with the Newport News and Mississippi Valley Co. for six first-class passenger cars and with the Lake Erie & Western for four passenger cars and two combination passenger and baggage cars.

The Cleveland, Cincinnati, Chicago & St. Louis has put on five new Wagner sleepers to run between Cincinnati and Sandusky. The cars each have 12 sections and a stateroom.

BRIDGE BUILDING.

Allegheny, Pa.—Probably 15 or 20 new small bridges will be built to replace old ones on the river division of the Allegheny Valley Railroad this spring and the coming summer.

Chester, Pa.—A plate-girder bridge will probably be erected at Chester. The City Engineer, E. H. Roberts, estimates its cost at $35,000.

Cincinnati, O.—The City Engineer has submitted a new plan for the Eighth street viaduct, shortening the viaduct 130 ft. and bringing out 386 ft. west of Evans, instead of running all the way to the Cincinnati, Hamilton & Dayton bridge. The estimate on this plan is $267,000. The modified plan has been acted upon favorably by the Board of Public Improvements. The viaduct is to be 2,917 ft. long.

Colburg, Or.—The Pacific Bridge Co., of San Francisco, Cal., has just completed a bridge across the McKenzie River, near Colburg, for the Southern Pacific. The bridge has a wooden span of 250 ft., and was built from plans of W. A. Grondahl, Superintendent of Bridges and Buildings for the Southern Pacific.

Cohoes, N. Y.—A bill has been signed by the Governor authorizing the construction of a viaduct across the ravine in Cohoes between Garner and Division streets.

Davenport, Ia.—The plans for the viaduct from Sylvan Water to Rock Island have been approved finally. The estimated cost is $35,000, and bids for the work will soon be asked.

Gainesville, Miss.—A. R. Smith will receive bids until May 28 for building a bridge across the Chattahoochee River near Shallow Ford. The bridge is to be 250 ft. long, with three stone pillars 24 ft. high, making two spans of 125 ft. each. Bids are to be on a wood, combina-

tion or iron bridge. For a combination or iron bridge the roadway is to be 12 ft. wide.

Georgetown, Tex.—The Commissioners' Court have awarded the contract to a Connecticut company for the construction of bridges in this county. Twelve iron bridges are to be erected, two of them over the South Gabriels River at Gergetown. All are to be finished by September. The cost of the 12 will be $40,000, to be paid by the county in 20-year six per cent. bonds.

Glasgow, Va.—The Glasgow Development Co. has awarded the contract to the Wrought Iron Bridge Co., of Canton, Ohio, for the construction of the bridge across the North branch of the James River, to connect its property with that of the Rockbridge Co.

Goshen, Va.—The new iron bridge at Goshen, across the Cowpasture River, and connecting the two principal parts of the town on Maury avenue, was put in place last week.

Hardy County, W. Va.—The County Court of Hardy County, W. Va., at its last session appropriated the money necessary for the building of a bridge across the Potomac River near Moorefield, W. Va., at a point known as Buzzard's Ford. The new bridge is to be of steel, and will have a total length of about 500 ft.

Indianapolis, Ind.—The Pittsburgh Bridge Co. has the contract for a plate girder viaduct 800 ft. long, over the railroad track in Indianapolis. The bridge is to be built jointly by the Indianapolis Union road and the city.

The County Commissioners opened bids last week for the bridge over Fall Creek at Floral avenue. The lowest of the seven submitted on the substructure being that of Enos Hege, $2,512, he was awarded the contract. There were nine bids on the superstructure, ranging from $6,200 to $7,150. The Commissioners took them under advisement.

Philadelphia.—Work on the Walnut street bridge is progressing rapidly. Work has begun on the iron work on the west side, and already one span is built and the girders up for another. On the east side the caisson is ready to be pumped out to permit the construction of the last pier that is to be built. The Pottsville Bridge Co. has the contract.

Portland, Me.—E. T. Burrowes & Co. have petitioned the city government to erect an iron lattice bridge over Spring street 22 ft. above the grades of the sidewalks.

Quebec.—The Privy Council of the Dominion Government have approved the application of the Quebec & Lake St. John Railroad to build a bridge over the River Metahetchouan.

Sacramento, Cal.—A bridge is to be built across the Laguna River by the Sacramento Supervisors.

San Francisco, Cal.—Bids were received by the Supervisors for the construction of a steel drawbridge across Channel street at Sixth street as follows: Bigelow & Little, $24,300; Healy, Tibbetts & Co., $23,500; Doe, Hunt & Co., two bids, $24,492 and $27,120; Darby, Laydon & Co., $26,800; B. McMahon & Co., $22,500; San Francisco Bridge Co., $21,560 and $21,960.

Tacoma, Wash.—Arrangements are being made for the building of a $15,000 girder bridge to take the place of the wooden structure at the foot of Fifteenth street. Some of the material for the bridge has arrived. The excavating work will be done during dry weather. An iron structure will, in the near future, take the place of the wooden drawbridge which spans the Puyallup River.

Towson, Md.—William H. Shipley, County Bridge Superintendent, has reported that it is necessary to erect an iron bridge over Brice's Run, on the road from Randallstown to Woodstock. The new bridge is to have one span of 60 ft. Mr. Shipley thinks the county will have to build three or four new bridges this year.

Wheeling, W. Va.—Paige, Carey & Co., the contractors for the Main street bridge over Wheeling Creek, at Wheeling, have commenced the work of laying the stone for the north abutment after a suspension of work through the winter. The bridge is to be completed before Oct. 1, and will be the second longest single arch bridge in the United States.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Alton, quarterly, $2 per share on the common and preferred stocks, payable June 1.

Cleveland & Pittsburgh, quarterly, 1¾ per cent., payable June 1.

North Pennsylvania, quarterly, 2 per cent., payable May 25.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic & Pacific, annual. 45 Broadway, New York City, May 21.

Baltimore & Potomac, annual, Baltimore, Md., June 3.

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 26.

Canada Southern, annual, St. Thomas, Ont., June 23.

Chesapeake, Ohio & Southwestern, special, 56 East Court, Memphis, Tenn., June 2.

Chicago, Burlington & Quincy, annual, Chicago, Ill., May 20.

Chicago & Eastern Illinois, annual, Chicago, Ill., June 3.

Chicago & Northwestern, annual, Chicago, Ill., June 4.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 6.

Concord & Montreal, annual, Concord, N. H., May 26.

Delaware & Bound Brook, annual, Trenton, N. J., May 28.

Denver & Rio Grande, annual, Denver, Col., May 26.

Des Moines & Fort Dodge, annual, Des Moines, Ia., June 4.

Duluth, South Shore & Atlantic, annual, Marquette, Mich., June 4.

Dutchess County, annual, adjourned, 35 Broadway, New York City, May 25.

Flint & Pere Marquette, annual, East Saginaw, Mich., May 20.

Florida Central & Peninsula, special, Jacksonville, Fla., June 1.

Fremont, Elkhorn & Missouri Valley, annual, Chicago, Ill., May 22.

Kansas City, Arkansas & New Orleans, annual, Beebe, Ark., May 21.

Manhattan (Elevated), special, 71 Broadway, New York City, May 27, to consider a proposed increase of the capital stock.

Michigan, Midland & Canada, annual, Detroit, Mich., June 4.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 20.

New York & Harlem, annual, Grand Central Station, New York City, May 19.

Northern (New Hampshire), annual, Concord, N. H., May 28.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 20.

Pittsburgh & Western, special, corner of Anderson street and River avenue, Allegheny, Pa., May 21, to act upon a proposed issue of bonds.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 1.

St. Paul & Sioux City, annual, St. Paul, Minn., June 6.

Sunbury, Hazleton & Wilkesbarre, annual, Philadelphia, Pa., May 19.

Toledo, Canada Southern & Detroit, annual, Detroit, Mich., June 4.

Tyrone & Clearfield, annual, Philadelphia, Pa., May 19.

Wheeling & Connellsville, special, for the purpose of organization, 1,304 Main street, Wheeling, W. Va., May 19.

Wisconsin Central, annual, Milwaukee, Wis., May 28.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* will hold its next annual convention at Lookout Mountain, near Chattanooga, Tenn., commencing May 20.

The *Association of American Railway Accounting Officers* will hold its annual convention at the Southern Hotel, St. Louis, Mo., May 27, commencing at 10 o'clock a. m.

The *American Institute of Mining Engineers* will hold its next meeting at Cleveland, O., June 2.

The *Master Car Builders' Association* will hold its annual convention at the Stockton Hotel, Cape May, N. J., commencing June 9, at 10 o'clock a. m.

The *American Railway Master Mechanics' Association* will hold its annual convention at the Stockton Hotel, Cape May, N. J., beginning at 9 a. m., June 16. Members wanting rooms reserved are requested to apply to the Secretary.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8 p. m The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

Engineers' Club of Cincinnati.

The regular meeting was held on April 16, with 28 members and several visitors present. Four applications for membership were received.

The folowing question received considerable attention from various members:

On reasonably firm sub-soil which form of curb is to be preferred in street construction: 5-in. × 14-in. curb on 6 in. concrete foundation with concrete backing to within 3 in. of the top, or 5-in. × 21 in. curb on clay or 2 in. of gravel with earth backing, difference in cost being 10 per cent. in favor of the shallow curb?

Mr. A. Petry read a paper giving a description of the apparatus used and the manner of measuring the amount of water delivered to the reservoirs by the pumping engines forming a part of the new water works plant being erected by the city of Covington, Ky.

Technical Society of the Pacific Coast.

At a meeting of the society, held Friday evening a week ago, in the Academy of Sciences Building, San Francisco, R. Hinchcliffe, Consulting Engineer of the Pacific Iron Works, read an interesting paper on the Hall Hydro-steam Elevator. F. Gutzkow had on exhibition an improved injector for raising liquids, especially acids.

The Cape May Conventions.

At a meeting of the Executive Committee of the Master Car Builders' and the Master Mechanics' associations held in the Murray Hill Hotel, New York, last week, a resolution was unanimously adopted, expressing confidence in the efforts Mr. Walton, proprietor of the Stockton Hotel, Cape May, is making to accommodate the persons who intend to be present at the conventions. This was done after Mr. Walton, the proprietor, had explained in detail his method of assigning rooms and his charges. The committees were satisfied that any person, who does not call for a selected room can have room and board for $3 a day.

PERSONAL.

—Mr. S. C. Weiskopf has been appointed Engineer and Eastern Agent of the Keystone Bridge Co., of Pittsburgh.

—Mr. W. A. Stone, Master Mechanic of the Louisville, Evansville & St. Louis at Huntingburg, Ind., has resigned.

—Mr. J. F. Klepper, Master of Transportation of the Newport News & Mississippi Valley Co., has tendered his resignation.

—Mr. A. K. Harvey, Chief Engineer of the Cincinnati, Lebanon & Northern, has resigned that position to accept a similar office on an Eastern road.

—Mr. W. C. Tallman, who has been the New England Passenger Agent of the Grand Trunk in Boston for many years, has resigned, and the office has been abolished.

—Mr. C. N. Osgood, formerly of the Western Freight Association, has been appointed Secretary of the Southwestern Railway and Steamship Association by Chairman Faithorn.

—Mr. George M. Basford, who has been Assistant Engineer of Tests on the Union Pacific, has accepted a position as Signal Engineer with the Chicago, Milwaukee & St. Paul, under Mr. George Gibbs, Mechanical Engineer.

—Mr. Samuel M. Cummings, formerly and for many years Master Mechanic of the Pittsburgh, Fort Wayne & Chicago road, died in Boston May 6. He was 75 years old, and had lived in the East since his retirement from business.

—Mr. F. I. Freeman, formerly President and General Manager of Ætna Machine Co., of Warren, O., is now General Superintendent of the plant of the Totten & Hogg Iron and Steel Foundry Co., of Pittsburgh, succeeding Mr. Robert C. Totten, who resigned last month.

—Gen. J. M. Corse, ex-Postmaster of Boston, has been offered the position of General Manager of the Flint & Pere Marquette, to succeed Dr. H. C. Potter, who recently resigned. It is expected that General Corse will accept the office.

—Mr. Charles L. Gately has been made Secretary of the Safety Car Heating and Lighting Company. Mr. Gately is a graduate of Stevens Institute of Technology, and has been for some years in the employ of the Safety Company and its predecessor, as an engineer in the manufacture and use of the Pintsch gas system.

—Judge W. P. McLean, of Mt. Pleasant, Tex., has been appointed a member of the Texas Railroad Commission. Mr. L. L. Foster has been appointed the third member of the commission. Judge McLean is a well-known lawyer in Texas and has been a District Judge. Mr. Foster has been State Commissioner of Agriculture for the last four years. The appointment of these two members completes the organization of the commission. Senator John H. Reagan will be chairman of the body.

—Mr. Alexander J. Knapp, Assistant General Freight and Passenger Agent of the Illinois Central at Memphis since 1888, has retired from the position and the office has been abolished. Mr. Knapp is a very well-known railroad officer in the South. He has been connected with the Illinois Central and the Mississippi & Tennessee since 1873 and with Southern railroads for 25 years. He was General Freight and Ticket Agent of the Mississippi & Tennessee from 1873 until its lease to the Illinois Central, in 1888.

—Mr. Lawson Valentine, President of the Valentine Varnish Co., of New York, died in that city last week. In the early part of his business career Mr. Valentine built a varnish factory in Cambridge, Mass., and when this building was destroyed by fire, Mr. Valentine then transferred his business to New York City. Here he was very successful, and soon became known as a leader of his trade. Mr. Valentine was a very benevolent man, warm in his attachments, shrewd in business, and a conscientious student of all financial and social propositions. A widow and two daughters survive him.

— Dr. William L. Breyfogle, Assistant to the President of the Louisville, New Albany & Chicago, under the new regime, resigned this week, and the office has been abol-

ished. He still remains a director and a member of the executive committee of the company. Dr. Breyfogle was President of the road for about a year, having been elected at the annual meeting in March, 1890. With his friends he had quietly obtained a majority of the proxies, and a new board of directors was elected. This election was a surprise. Serious charges of mismanagement have been brought against Dr. Breyfogle, but the information about the character of the charges is contradictory.

—Mr. Peter Ward, of the railroad contracting firm of Ward and Lary, died in Newburg, N. Y., May 10. His health had been failing since last November, when his tongue was removed for cancer. Mr. Ward was born at Ramapo in 1827. In early life he was a conductor and civil engineer, and in 1851 he became Superintendent of the Newburg branch of the New York, Lake Erie & Western, and filled that placed until 1859, except for one year, 1853, when he built the Maysville & Lexington road, in Kentucky. In 1859 Mr. Ward formed a partnership with Mr. Thomas Lary, who died a few months ago. The firm has, since that time, been extensively engaged in building railroads, the last contract being for a tunnel through the Shawangunk Mountains for the New York, Ontario & Western. The firm built a portion of the Sterling Mountain road, the Newburg & New York, 18 miles of the Hackensack road, 35 miles of the road for the New Jersey Southern, the road between Spring Valley and Stony Point, N. Y.; the Smyrna & Delaware Bay road, 50 miles of the St. Louis & San Francisco through the Indian Territory, and the section of the West Shore between Newburg and Highland, also through Monroe County and between Cocymans and Alleghany. Mr. Ward had served as Mayor of Newburg and as a State Senator. He leaves six children, one of his daughters being Mrs. Royal C. Vilas, wife of the President of the New York Air-Brake Co.

ELECTIONS AND APPOINTMENTS.

Altoona & Wopsononock.—W. T. Forsythe, Chief Engineer, formerly Superintendent of the Media Division of the Philadelphia, Wilmington & Baltimore, has been appointed Superintendent of this road, with headquarters at Altoona, Pa., succeeding G. A. Patton, resigned.

Baltimore & Lehigh.—Only a partial list of the directors of this company was given last week. The directors and officers elected are: President, William Gilmor, Baltimore; Secretary, John K. Shinn, Baltimore; Treasurer, Fridge Murdock, Baltimore; directors, Hugh B. Jones, Baltimore; Charles R. McConkey, Peachbottom, Pa.; Frank G. Metzgar, York, Pa.; Samuel H. Crawford, Winfield J. Taylor, John K. Shinn and Fridge Murdock, Baltimore, and W. F. Walworth, Cleveland, O.

Beardstown, Fort Madison & Sioux City.—The original charter of this company was filed in Illinois several weeks ago, and last week an amended charter was filed. The following are named as directors in the new charter: Joseph M. Rusk, Charles Brewster, Samuel Altee, Nelson C. Roberts, Wm. J. McCoy, James H. Duffy, George H. Schaefer and Dennis A. Morrison, Fort Madison, Iowa; Charles V. Chandler, Albert Eads and W. H. Hamline, Macomb, Ill.; James E. Vail, Industry, Ill.; Reese H. Griffith and Sylvanus R. Montgomery, Rushville, Ill.; John H. Nicholson and Henry M. Schwoldt, Beardstown, Ill., and D. M. Halstead, Keechsbury, Ill.

Beauharnois Junction.—The annual meeting was held at Point St. Charles, Que., May 5. The following Directors were elected: L. J. Seargeant, W. Wainwright, Henry Starnes, E. H. Bisson, M. Branchaud, S. W. Foster and Julien Hebert. At a subsequent meeting of the Board, Messrs. Seargeant and Wainwright were elected President and Vice-President, respectively.

Berlin.—The annual meeting was held in Pittsburgh, May 4. The election resulted as follows: President, J. B. Washington, Pittsburgh; Secretary, A. W. Black, Pittsburgh; Treasurer, W. H. Ijams, Baltimore: Directors, W. H. Koontz, Somerset, Pa.; S. and S. A. Philson, Berlin; A. M. Ross, Confluence, vice J. V. Patton, resigned; J. Reed Torrence, Wilkinsburg, vice W. T. Manning, resigned; S. C. Hartley, Meyersdale, vice Robert Garrett, resigned.

Camden & Burlington County.—The stockholders of the company elected the following directors at a meeting at Mount Holly, N. J., May 11: John S. Irick, Richard C. Shreve, William H. Gatzmer, Joseph N. Du Barry, Richard Ashhurst, Clifford Stanley Sims, John C. Sims, W. Budd Deacon, W. Hasell Wilson, William J. Sewell, Joseph H. Gaskill, Charles E. Hendrickson, Henry D. Welsh, Theodore B. Gaskill, Frank Ellmaker. The Directors organized by electing John S. Irick, President; Richard Ashhurst, Secretary; John M. Wood, Treasurer. The only change in the Directors is the election of F. Ellmaker the new Superintendent of the Amboy division, to succeed W. N. Bannard.

Central of New Jersey.—The directors of the company have elected Walter G. Oakman, formerly of the Richmond & Danville, Vice-President of this road in place of Joseph S. Harris, recently resigned.

Chicago & Eastern Illinois.—Frank Bruce, for some time Master Mechanic of the Atchison, Topeka & Santa Fé, has been appointed Master Mechanic of this road, in place of C. J. Clifford, resigned.

Chicago & Northwestern.—B. Malloy has been appointed Master Mechanic of the Wisconsin division of the road, with headquarters at Chicago. Mr. Malloy has been for several years general foreman for the same company at Milwaukee. Joseph Cockfield, for several years general foreman of the shops at Boone, Ia., has been appointed Master Mechanic at Clinton, Ia., vice Robert Quayle, resigned.

Chicago, Milwaukee & St. Paul.—The offices of W. G. Collins, General Superintendent, and G. E. Simpson, Superintendent of Transportation, have been removed from Milwaukee to Chicago.

Chicago, Rock Island & Pacific.—F. D. Lyon has been appointed Northeastern Passenger Agent, with headquarters at Detroit, Mich. M. P. Washburn, who formerly held that position, has resigned to accept service elsewhere.

Concord & Montreal.—Frank S. Streeter, of Concord, N. H., has been elected Clerk of the road, vice Hon. William M. Chase, resigned.

Corpus Christi & South America.—The following Directors of the Pan-American Construction Co., which is building this road, were elected at a recent meeting: E. H. Ropes, President, Corpus Christi, Tex.; George H. Towle, Vice-President and General Manager, Boston; J. S. Anthony, Treasurer, Boston; J. G. Sullivan, Assistant Treasurer, Boston, with headquarters at Corpus Christi; George A. Hatch, Boston, Secretary; William Davis, General Superintendent, Corpus Christi.

Delaware & Hudson Canal Co.—The annual meeting of the stockholders of the company, held in New York City, May 12, resulted in the election of the old Board of Directors as follows: Le Grand B. Cannon, James Roosevelt, Robert M. Olyphant, Benjamin H. Bristow, John A. Stewart, R. Suydam Grant, William H. Tillinghast, Johnston Livingston, Alfred Van Santvoord, George C. Clark, William W. Astor, James A. Roosevelt and Samuel Keyser. The Board re-elected the old officers.

Delaware River.—The annual meeting of the company was held at Woodbury, N. J., last week, when the following Board of Directors was elected: William S. Connor, Samuel Hopkins, Alexander Justice, H. A. Dupont, John S. Gerhard, A. R. Foster, E. H. Shuster. The board organized by electing William S. Connor, President and Treasurer; S. H. Miller, Secretary.

Dillsburg & Mechanicsburg.—At an election held at Mechanicsburg, Pa., May 5, the following were elected: President, Thomas B. Kennedy; Directors, Thomas B. Kennedy, Edward B. Watts, Henry McCormick, J. Herman Bossler, William Penn Lloyd, Joseph Milleisen and Christian Bender.

Eastern New Hampshire.—The annual meeting of stockholders of the road was held at Portsmouth, May 5, and the following Directors were elected: Moody Currier, Manchester, N. H.; Dexter Richards, Newport; Edward L. Gibbings, Beverly, Mass.; William H. Goodwin, Boston; Frank A. Philbrick, Rye; Edward A. Abbot and Samuel C. Eastman, Concord, N. H. The Directors organized by choosing Moody Currier President and William H. Hackett Clerk.

East Line & Red River.—E. M. Alvord, recently Purchasing Agent of the International & Great Northern, has been appointed General Superintendent of this road, with office at Greenville, Tex. Horace Booth has been appointed General Freight and Passenger Agent, with headquarters at Greenville. Mr. Booth was formerly Commercial Agent of the International & Great Northern at Tyler, Tex.

Gainesville, Henrietta & Western.—The stockholders of the company held their annual meeting at Gainesville, Tex., May 6, and elected Directors for the ensuing year. The Texas members of the Board are: F. M. Dougherty, R. D. Gribble, H. E. Eldridge and J. M. Lindsay, of Gainesville, and R. C. Foster, of Denison. F. M. Dougherty was elected President, R. D. Gribble, Vice-President, and J. M. Lindsay, Secretary and Treasurer.

Hutchinson & Southern.—A new Board of Directors was elected at Hutchinson, Kan., May 6. The directors are: Charles H. Davis, A. Clark, George Hubbell, Herman Tuper, G. R. Duckworth, C. B. Matthews, of Cincinnati; H. H. Christy, E. E. Wise, of Chicago; Charles Collins, A. P. Byers, of Hutchinson, and S. R. Darrah, of Anthony, Kan. The officers elected are as follows: President, H. H. Christy; Vice-President, Geo. R. Duckworth; Secretary, E. E. Wise; General Manager, R. N. Archer; Traffic Manager, Charles Collins; Superintendent, A. P. Byers.

Jacksonville, Tampa & Key West.—J. P. Beckwith, formerly General Agent of the Florida Central & Peninsular, at Jacksonville, Fla., has been appointed General Freight Agent of this road, with headquarters at Jacksonville. He succeeds James Colhoun, who has resigned to accept a similar position on the Delaware & Hudson.

Lehigh Valley.—Charles H. Tutton, who for several years was in charge of the Lehigh Valley terminals in Buffalo, and making plans for the Tifft-farm docks, and who for several years past has been engaged in engineering work at Buffalo, has returned to the service of the company, and has been appointed Resident Engineer on the line near Batavia, N. Y.

Louisiana & Missouri.—At the annual meeting held last week the following officers and Directors were elected: President, Bradley D. Lee; Vice-President, R. P. Tansey. Directors: Arthur Lee, Eleneius Smith, Henry Cabot Lodge and John P. Ellis. C. S. Foster was elected Secretary and F. A. Wann Assistant Secretary.

Louisville, Evansville & St. Louis.—John Terrance, Master Mechanic of the Evansville & Terre Haute, now has his jurisdiction extended over this road. His headquarters will remain at Evansville, Ind.

Louisville, New Albany & Chicago.—The offices of Engineer of Maintenance of Way on the Indianapolis division and on the Louisville division has been abolished, and the duties of the offices assigned to the Chief Engineer.

Louisville Southern.—The company held its annual meeting in Louisuille, Ky., May 4, and elected Directors. The following are new directors: J. M. Fetter, B. H. Young, William F. Booker. They replace H. T. Hanford, deceased, Charles T. Ballard and Julius Bamberger.

Mahoning Coal.—At the annual meeting of the stockholders, held last week, the following directors were elected: D. P. Ells, John Newell, C. M. Depew, Samuel Mather, C. H. Andrews, W. C. Andrews and C. P. Leland.

Michigan Central.—The following directors were elected at the annual meeting at Detroit, May 7: Cornelius Vanderbilt, William K. Vanderbilt, Edwin D. Worcester, Samuel F. Barger and Chauncey M. Depew, of New York; Henry B. Ledyard and Ashley Pond, of Detroit; William L. Scott, of Erie, Pa., and E. S. Winston, of Chicago. Proxies were cast for stock representing $15,000,000.

Missouri Pacific.—C. A. Parker, formerly General Freight Agent of the system, has been appointed Acting Freight Traffic Manager of the Missouri Pacific, the St. Louis, Iron Mountain and the leased and operated independent lines of the Missouri Pacific.

New York, Chicago & St. Louis.—At the annual meeting last week the only change in the Board of Directors was the election of Samuel E. Williamson, General Counsel of the line, in place of John H. Wade, deceased.

Norfolk & Western.—The following directors were elected at the shareholders' meeting, at Roanoke, Va., last week: F. J. Kimball, C. H. Clark, Charles Hacker, Joseph I. Doran, Richard S. Brock, Samuel A. Crozer, A. J. Dull, Wm. C. Houston, jr., U. L. Boyce, Walter H. Taylor, Robert Fleming, Howland Davis and Everett Gray. The board elected F. J. Kimball, President; Charles G. Eddy and Joseph H. Sands, Vice Presidents; W. G. McDowell, Treasurer; A. J. Hemphill, Secretary; and Joseph I. Doran, Solicitor. Mr. Sands is also General Manager.

Olympia & Chehalis Valley.—The property is now controlled by the Port Townsend Southern, but the organization is continued. Recently, W. H. Starbuck, of New York, was elected President, and Col. C. J. Smith, of Seattle, Vice-President, vice Miles C. Moore, resigned.

Oregon & Washington Territory.—At a meeting held at Pendleton, Or., April 30, G. W. Hunt, of Walla Walla, Wash., was re-elected President; C. B. Wright, Jr., was elected Vice-President and General Manager, and Charles Herman, Secretary and Treasurer. Following are the directors: G. W. Hunt, C. B. Wright, Jr., Charles Herman, K. Alexander, C. H. Carter and J. L. Killian.

Philadelphia & Reading.—The following appointments and changes are announced: C. F. Kindred appointed General Agent at Philadelphia, with such duties as the President may from time to time assign him. Samuel Garwood appointed City Freight Agent at Philadelphia, vice J. W. McFarland, assigned to other duty; Robert S. Davis appointed Manager of the Atlantic City road. The office of Managing Director of the Atlantic City has been abolished.

Rome, Watertown & Ogdensburg.—The office of L. A. Emerson, General Traffic Manager, is now located in the Wagner Palace Car Co.'s building, No. 51 East Forty-fourth street, corner Vanderbilt avenue.

Salt Lake, Hailey & Puget Sound.—The incorporators and the Utah directors are: J. R. Nichols, Edmund Wilkes, Frank Dyer and J. R. Middlemiss.

Sevier Valley.—The directors are: David C. Dodge, A. E. Welby, William F. Colton, George Goss and Robert Harkness. The shareholders are: Robert Harkness, D. C. Dodge, Theron Geddes, A. E. Welby, P. G. Fennelly, Thomas Maroneux, Earnest A. Greenwood, C. W. Bennett, W. F. Colton and George Goss, all of Salt Lake City, Utah, which is to be the principal office of the company.

Shenandoah Valley.—The following directors were elected last week: F. J. Kimball, Joseph I. Doran, W. C. Bullitt, Richard S. Brock, and Charles H. Mellon. The board elected the same officers as for the Norfolk & Western.

Somerset & Cambria.—The following Directors of this leased line of the Baltimore & Ohio were elected May 4: President, J. B. Washington; Secretary, A. W. Black; Treasurer, W. H. Ijams; Directors, W. H. Koontz, Somerset; C. S. Wight, Pittsburgh; M. Lewis, Clarksburg, W. Va.; W. J. Hitchman, Mt. Pleasant, vice Robert Garrett, resigned; William Reed, Baltimore, vice J. V. Patton, resigned; William P. Kooser, Somerset, vice W. T. Manning, resigned.

South Florida.—B. R. Swoope, Superintendent, has been placed in charge of the Operating Department of this company, and all business with that department will be conducted by him.

Thomasville Silver Valley & Pee Dee.—The following directors were elected at the recent annual meeting: J. T. Cramer, J. H. Lambeth, J. A. Leach, D. T. Lambeth, George Kinney, P. C. Thomas, L. W. Elliott, Valentine Mauney and J. M. Badgett. J. T. Cramer was re-elected President, J. H. Lambeth, Secretary and Treasurer, and C. W. Pearson, Chief Engineer. The office of the company is at Thomasville, N. C.

Toledo, Peoria & Western.—H. D. Gould has resigned as General Freight and Passenger Agent on account of ill health. Daniel Mowat has been appointed General Freight Agent, and the duties of the General Passenger Department will devolve on E. N. Armstrong, General Superintendent.

Tombigbee.—The following are the officers of this company: President, B. A. Vaughan; General Manager and Acting Chief Engineer, C. E. Rodenberg; and Secretary and Treasurer, F. M. Leigh. The following directors compose the Executive Committee: B. A. Vaughan, J. O. Banks, C. A. Johnston, W. H. Sims and J. E. Leigh. The principal office of the company is at Columbus, Miss.

West Virginia, Alderson & Central.—The following are the incorporators of the company, which has been organized in West Virginia: William T. Conquest, Jr., Philadelphia; Wyndham Bolling, W. B. Waldron, and John A. Upshur, Richmond, Va., and James H. Miller, Hinton, W. Va.

Wilmington & Northern.—The annual meeting of the road was held at Birdsboro, Pa., May 4. The following Directors were re-elected: Col. H. A. Dupont, George Brooke, Dr. Charles Huston, A. L. Foster, John S. Gerhard, Col. L. Heber Smith and William S. Conner.

Wisconsin Midland.—The Board of Directors of the company elected officers as follows at a meeting at Fond du Lac, Wis., April 29: President, A. Gallowa, Fond du Lac; Vice-President, Col. N. Boardman; Chairman of Directors and Secretary, D. C. Lamb; Executive Committee, D. C. Lamb, N. Boardman, C. B. Bartlett.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Alleghany & Kinzua.—Grading was begun this week for several extensions of the road. A branch seven miles long will be built from Morrison, one six miles long from Sugar Run, Pa., and one of three miles between Frecks, N. Y., and Yagar Mills. A six-mile extension is now being built from Vandalia.

Altoona & Wopsononock.—The grading on the road is now completed as far as Wopsononock, Pa., a distance of eight miles from Altoona. The tracklaying is also about completed and the road will be opened for freight and passenger traffic on May 25. It will be extended to Frugality, a distance of seven miles, during the summer. The survey of the proposed extension is now being made.

Anderson Belt.—The business men of Anderson, Ind., have organized a stock company for the purpose of building a belt road. The capital stock is $50,000, which has all been subscribed. The road will be six miles in length, extending from the crossing of the tracks of the Cleveland, Cincinnati, Chicago & St. Louis and Pittsburgh, Fort Wayne & Chicago to the American Wire Nail Works. The stockholders are: C. S. Burr, L. M. Cox, C. P. Garvey, C. B. Gerard, W. L. Finch, W. B. Blake, T. J. McMahan, J. J. Netterville, George Lilly, J. L. Bilgore, W. T. Durbin and J. M. Morgan.

Brierfield, Blocton & Birmingham.—The Bessemer Division from Gurnee north to Bessemer, Ala., will be opened for passenger traffic May 17. Freight trains have been running for some weeks, but the ballasting and work on the embankment at Gentry's Gap had to be completed before passenger trains could be put on. The division is about 20 miles long. The trains will run into Birmingham over the tracks of the Alabama Great Southern from Jonesboro.

Buffalo & Geneva.—Comparatively little of the grading on the line between Geneva and Buffalo, N. Y., remains uncompleted. The Chief Engineer expects that through trains will be running into Buffalo over the line by Oct. 1 of this year. "Of course the line will not be in shape to handle business properly, but we will have our track finished so that we can run freight and local passenger trains. We will hardly do all of our through business over the new line much before the spring of 1892. No, the work of construction is not progressing more rapidly than expected, but it is so far advanced that unless we get far more bad weather than we expect the line will be ready for business on the date named."

Camden County.—This new road, which is under the control of the Philadelphia & Reading, was formally opened for passenger traffic May 10. The extension begins at Mount Ephraim, N. J., and continues to Greenlock, N. J., 13 miles from Camden. The line has been in operation for six weeks past for freight traffic. It passes through the villages of Bellmawr, Runnemede, Glendora, Hiltop, Blenheim and Blackwood.

Canadian Pacific.—J. W. Buchan & Co. have been awarded the contract for the improvements on the line east of Rat Portage, Ont., on the Western Division. The work to be done this summer is rockcutting at three points, where a deflection of the line is to be made to avoid bridges. It is estimated that to complete the contemplated work $500,000 will be expended, but at present contracts will only be awarded for work amounting to $100,000.

Canadian Roads.—Thomas Marks, President of the Port Arthur, Duluth & Western, and W. W. Russel, W. R. Cameron, George T. Marks and H. A. Wiley, all of Port Arthur, Ont.. have applied to the Dominion Parliament for a charter for a company which proposes building a road from the Canadian Pacific at a point between Carlstadt and Bridge River, about 100 miles west of Port Arthur, in a southwesterly direction, to the iron beds of the Atikonan iron range. The surveys which have been made indicate deposits of valuable ore.

Carolina, Cumberland Gap & Chicago.—George Potts, of New York City, is reported to have begun the grading for an extension from Edgefield northwest to Greenwood, S. C., on the Richmond & Danville.

Charleston, Cincinnati & Chicago.—The Receiver proposes to have the track laid this summer on the line between Rutherfordton and Marion, N. C., on the Western North Carolina Division of the Richmond & Danville. Rutherfordton is now the present northern terminus of the operated line. Most of the grading to Marion, a distance of 25 miles, was completed last fall before the appointment of the Receiver. The repairs to this work and the tracklaying will be done under the authority of the Receiver, and no contracts will be let.

Charleston, Sumter & Northern.—The extension that has been building from Sumter north to Darlington, S. C., since early last fall, was opened for traffic this month. This line is 37½ miles long, and the construction work has been done by the Central Carolina Construction Co. The grading and bridging is practically completed on a further extension from Darlington northeast to a connection with the Cape Fear & Yadkin valley road at Bennetsville, S. C. The length of this extension will be 24 miles, and the track has already been laid on about 10 miles. Trains will probably begin running between Sumter and Bennetsville about July 1.

Chicago & Northwestern.—The company is about to issue $5,000,000 30-year five per cent. debenture bonds, similar to the existing debentures. The purpose of the issue is for funding in part expenditures which have been incurred for second track constructed and in progress, the cost of which exceeds $4,000,000, and for large purchases of valuable real estate at principal terminals and for equipment. The bonds have been taken by Kuhn, Loeb & Co., of New York, who, it is understood, have already disposed of them by private sale.

Chicago & Orleans.—Oliver Ferguson & Son, of Evansville, Ind., have closed a contract with the Central Improvement Co. for building the road from Farina, Ill., south to the Ohio River, and, it is reported will commence work during this month.

Chicago & West Michigan.—McLean Bros., of Coldwater, Mich., were awarded a contract last week for building the extension from Traverse City north through Charlevoix to Petoskey City, Mich. A branch from Williamsburg north to Elk Rapids is also to be built. The length of the main line of the extension will be 70 miles and of the branch 10 miles. The line from Traverse City is to follow the shore line of Grand Traverse Bay very closely the entire length of the extension.

Clear Lake & Northern.—The final surveys for this California road from Ukiah to Lakeport, about 20 miles, were completed early this month. The survey begins at a point on the San Francisco & North Pacific near Ukiah and extends through the Cole Creek and Blue Lake pass and through Scotts Valley to Lakeport. The surveys for the line have been in progress for several months. The right of way has been secured for about half the distance to near the Blue Lakes. F. H. Long, of Lckeport, is a director-

Columbia & Kootenay.—The road is a branch of the Canadian Pacific and has been completed from Sproat's Landing near the junction of the Upper Columbia and Lower Kootenay rivers, south to Nelson, B. C. The line is about 28 miles long. From the point at which the road connects with the Columbia River there is steamer navigation to Marcus, the northern terminus of the Spokane & Northern. The distance is about 54 miles. There is also navigation north of Sproats via Kootenay Lake and the Arrow lakes to Revelstoke, B, C., on the Canadian Pacific, a distance of about 150 miles.

Concord & Montreal.—The Nashua, Acton & Boston branch, which is used by the Boston & Maine, is to be double-tracked this summer between Concord Junction and a distance of 24 miles.

Coos Bay, Roseburg & Eastern.—The contractor has about 400 men at work on the grading south of Marshfield, Or. The work has been completed as far as the Coquille River, with the exception of a short section near Utter City, about 10 miles from Marshfield. It is expected that the road will be in operation from Coos Bay to Myrtle Point by August. The road runs south to Myrtle Point and thence northeast to Roseburg on the Southern Pacific. A locating survey is now being made on this last section of the road from Myrtle Point, to the Southern Pacific, a distance of 97 miles.

Delaware & Hudson Canal Co.—The contractors have begun to lay the rails for the second track from Fort Edward north to Whitehall, N. Y., on the Saratoga & Champlain division, a distance of 23 miles. All the bridges have been built and the rock excavation in the cuts finished. The grading has also been finished, except for a short distance near Fort Ann, about 10 miles from Fort Edward. The line will probably be ready for operation by June 1. With the completion of the section to Whitehall the company will have 39 miles of double track road on its Northern Division, beginning at Saratoga, which has been completed this or last year. The contractors for the work have been J. Holler, of Albany, N. Y.; E. Sweet, Albany; the Drake & Stratton Co., 143 Liberty street, New York, and Smith & Hanfield, 61 Broadway, New York City.

Duluth & Winnipeg.—Grant Bros., who are building the line between Cloquet and West Duluth, Minn., expect to complete the line ready for traffic by July 1. The distance is about 17 miles. The right of way has been cleared as far as Short Line Park; some grading has been done between that point and Cloquet, and temporary bridges built over the ravines for the convenience of the graders. The grading will be very heavy and it will probably cost $22,000 per mile to construct the branch. It is stated that the contractors propose to put 1,000 men on the work in a few days.

Elk Hill Coal & Iron Co.—The company has leased about 1,000 acres of coal land about 1½ miles west of Forest City, and about five miles above Carbondale, Pa. The firm proposes to build a branch road of some two miles in length from its colliery to connect with the Jefferson branch of the New York, Lake Erie & Western, and also to connect with the New York, Ontario & Western near the same point.

Florida.—The following bills have been introduced i the state legislature: To amend the land grant of the Western Railroad of Florida; to aid the construction of a line from the terminus of the Green Cove Springs & Melrose road to Melrose, with branches to Starke and Hawthorne; to grant lands to the Mexican Gulf, Pacific & Puget Sound and to extend the land grant limit of the Georgia Southern & Florida and the Florida Midland & Georgia.

Grand Trunk.—A branch has been surveyed to the mines of the Eustis Mining Co., at Capleton, in Ascot Township, Que., near the Vermont state line, and with which the Boston & Maine connects. The work on the branch will be very heavy, and the grades may be as high as 102 ft. per mile. The cost of the line is estimated at $25,000. The question came up last week before the Railroad Committee of the Dominion Privy Council, for approval of location, but a decision was not reached.

Houston, Central Arkansas & Northern.—Henry, Forrest & Co., of St. Louis, who have the contract for building the southern division of this road from Columbia to Alexandria, Ga., a distance of about 60 miles, have the work nearly completed. A large force has been employed during the winter, and only a small part of the grading is unfinished. The tracklaying south of Columbia was begun some months ago. The contractors will soon begin to lay the rails from the station of the Texas & Pacific at Alexandria north to the Red River. The bridge across the river is to be built by the Union Bridge Co., and it is expected that the material for the superstructure will be delivered within a few weeks.

Jacksonville, Tampa & Key West.—There is a good chance that the changing of the narrow gauge Southern Division between Bartow and Punta Gorda, Fla., to standard gauge, which has long been proposed, will be carried into effect this year. It is proposed to begin the first work before June, and probably the most important contracts will be awarded in a few days. The line upon which the work is to be done is the only division of the system not standard gauge. The line is about 80 miles long, and is the old Florida Southern road.

Kansas City, Watkins & Gulf.—Several sub-contracts have been recently let for construction work near Alexandria, La., the northern terminus of the road. The Prosser-Ware Construction Co., of St. Louis, has the general contract for the grading. D. B. Lyles, of Shreveport, La., has the sub-contract beginning 25 miles south of Alexandria, Ward & Courtney about seven miles south of Alexandria, and John Carsons, of Greenville, Miss., also has a contract on the section. These are the principal sub-contractors. About 300 laborers are working near Alexandria, and this number is to be increased shortly.

Keystone.—This road was built last September by a private company and has only been recently chartered as a corporation under the Pennsylvania state laws. An extension about two miles long will be built this summer. The present line is four miles long, the terminus being at Gardeau. The construction work on the line is now nearly complete and the extension is also practically all graded. There are no heavy grades or cuts and no bridges of importance. The road is not bonded, nor has any floating indebtedness been created for the construction work or for equipment.

Lancaster, Oxford & Southern.—The contract for the extensions of this road from White Rock north to Quarryville, and from Oxford, Pa., its eastern terminus, will probably be awarded in a few weeks. The surveys have been made and a third rail has been laid on part of the existing narrow-gauge road between the Susquehanna River and Oxford. The extension from Oxford will probably be the first of the lines to be built. It is stated that the grading will be commenced this month. The extension has been surveyed along the Little Elk River and southeast from Oxford to the Baltimore & Ohio at Singerly, Md., about 10 miles east of Port Deposit.

Manistee & Grand Rapids.—The tracklaying on the main line near Manistee, Mich., which has been suspended during the winter was resumed May 4, and about 50 men are now working on the line. The road is permanently located from Manistee to the crossing of the Chicago & West Michigan road in Lake County, a distance of 31 miles; also a branch along the west shore of Manistee Lake, three miles in length. The grading is completed on 21 miles of the main line and 1.7 miles of the branch. Up to Dec. 31 the track had been laid on 10 miles of the main line and on a mile and a half of the branch. Seven miles more will bring the track into a large body of standing pine timber, and the road will then begin to do a good business in the hauling of logs. The length of the road as projected, from Manistee to Grand Rapids, Mich., will be 110 miles. There are no villages on the located portion except Oak Park and Filer City, suburbs of Manistee. The preliminary surveys have been extended to Luther, 11 miles beyond the Chicago & West Michigan crossing. The Directors have determined to complete the construction as far as the West Michigan crossing this season. Beyond this crossing nothing has yet been determined upon. The company has so far done all its construction work with its own forces, except two truss bridges which were built by the Massillon Bridge Co. It will doubtless continue this policy and not let contracts. The work to be done this season is not heavy. The maximum gradients are 52 ft. per mile and maximum curves five degrees.

Manistique & Northern.—The company was chartered in Michigan last week. It is to build a road through the Northern Peninsula of Michigan from a connection with the Minneapolis, St. Paul & Sault Ste. Marie, at Manistique, on Lake Michigan.

Marietta & North Georgia.—The Receiver expects that an order will soon be entered by the court authorizing him to issue $1,100,000 of Receiver's certificates to pay for various improvements outlined in a report made soon after the Receiver was appointed. The principal improvements proposed are the completion of the Knoxville Belt, building a bridge at Knoxville, reducing the grades and curvature, changing the gauge of the Murphy Branch to standard gauge, and constructing a line around the heavy grade at the "W" or switchback on the Hiawassee River, in Tennessee. The committee of the bondholders appointed to consider plans for the reorganization of the road have not yet come to an agreement, and it is not likely that a plan will be formulated for some months.

Mobile & Girard.—The contractors are laying about half a mile of track daily on the extension from Troy, Ala., south. The present end of track is about 18 miles south of Troy, and it is expected that the road will be completed to Andalusia by July 1. The grading is finished to that point, about 50 miles south of Troy. The terminus of the extension will be at Saginaw, on the Conecuh River, about four miles southwest of Andalusia. The road has been built along the river valley instead of by the ridge route, as at first proposed. The following stations have been established, the distance given being that south from Troy: Alfred's, three miles; Hallsville, nine miles; Alva. 13 miles; Glenwood, 17 miles; Maricopa, 22 miles; Markle, 26 miles; Pheba, 30 miles; Searight, 36 miles; Christine, 44 miles, and Andalusia.

Mohawk Valley & Northern.—The following account of the status of work on the line between Poland and Malone, N. Y., was published this week: The contracts have been given out for the extension of the old Herkimer, Newport & Poland northward from Poland to Jock's Lake, some 50 miles, and from Malone southward 70 miles to Tupper's Lake. About 2,000 Italian laborers are already at work at Malone grading the new road; about the same number of men have been set at work at Poland, in Herkimer County, extending the road northward. Engineers of the new line are busily at work in Franklin and Hamilton counties. It is intended to build a branch from Paul Smith's, on St. Regis Lake, to Saranac Village, on Saranac Lake. The new road, as now planned, will run southward from Malone, eastward of the Salmon River, and thence almost directly south to St. Regis Lake. From Paul Smith's it will be diverted to the southwestward, running upon the west side of the Upper Saranac Lake. From the Upper Saranac Lake it will extend southwestward to Tupper's Lake, Little Tupper Lake, Big Moose Lake, the eighth lake of the Fulton chain, and thence to Jock's Lake, in Herkimer County, where it will meet the extension from Herkimer northward. The total length of the road will be 150 miles.

New Albany Belt & Terminal.—The last portion of the tracklaying was finished last week, when the rails were laid across the trestle at New Albany. The connection at the end of the trestle with the Louisville, Evansville & St. Louis tracks will be made this week. The road is now practically ready for operation. It is 10 miles long, and begins at New Albany, Ind., extending along the Ohio River to the terminus of the Kentucky & Indinna Bridge Co. on the north bank of the river, opposite Louisville. The road will be operated in connection with the Kentucky & Indiana Bridge Co.

New Caledonia.—This road is being built from Conocoheague Island to the mines of the Caledonia Iron Co., near New Caledonia, Nova Scotia. It is a short line, and will be opened in a few months.

New Roads.—Press dispatches state that the contracts were let last week for building the proposed line from Valleyfield, Que., south to Malone, N. Y., a distance of 15 miles, connecting the Canada Atlantic with the Vermont Central.

Frank C. Ross, of Tacoma, Wash., is the President of a company which proposes to begin grading this month on a road from Commencement Bay at Tacoma south to Puyallup, Wash., 7½ miles. The right of way through the Indian reservation has been secured. The line has been located on the north bank of the Puyallup River out of Tacoma, but it crosses to the south bank near the reservation. An electric line will be built to Sumner by the same company as an extension of the proposed steam road.

A corps of engineers has been at work for some days past, making the preliminary survey for a road from Shenandoah City west to Harrisonburg, connecting the Norfolk & Western system at the former point and with the Baltimore & Ohio at the latter town. The length of the line is a little over 12 miles.

It is stated that a survey is being made for a double-track road to be built by Carnegie Bros. & Co., from McKeesport to the Braddock and Homestead plants, Pa. It is to begin at the Duquesne steel plant, and will parallel the Monongahela River to a point opposite Port Perry, where the river will be bridged to reach the Edgar Thomson plant, and from there it will run to the Homestead plant, a distance of five and a half miles in all.

A company has been organized in Michigan which proposes to build a road from Alpena, on Lake Huron, the northern terminus of the Detroit, Bay City & Alpena, west a distance of about 20 miles to Hillman, in Montmorency County, and thence southwest to Grayling, on the Michigan Central, about 75 miles from Alpena. There are large cedar and hardwood forests along the route, and part of the line is also through well-de-

veloped farming lands. About $50,000 of the capital stock of the company will probably be subscribed at Alpena. The following directors have been chosen: W. L. Churchill, G. L. Maltz, F. W. Gilchrist, A. W. Comstock, W. H. Potter.

Norfolk & Western.—George T. Mills, of Pulaski, Va., the contractor for the Cripple Creek and North Carolina extensions, will probably resume the grading on these lines, which was suspended in the middle of the winter, this week. About 30 miles remains to be built on the North Carolina extension to complete it to the proposed connection with the Cape Fear & Yadkin Valley at the North Carolina state line southeast of Gossan, the present terminus.

Ohio & Big Sandy.—The proposed extension from Louisa will probably be placed under construction early this summer. It is understood that contracts are to be awarded soon for building 16 miles of the line from Louisa to Richardson, Ky. The work is to be let in four sections, and completed within the next five months.

Omaha, Kansas Central & Galveston.—In compliance with the Nebraska law the company has filed a copy of its charter with the Secretary of State. The corporation proposes to build from Omaha to Galveston. The capital stock is placed at $18,000,000. The headquarters are at Lyons, Kan. This charter was granted under the laws of Kansas, and the incorporators are residents of Kansas and New York.

Paducah, Tennessee & Alabama.—B. F. Johnston, contractor for the extension of the road from Paris to Hollow Rock, Tenn., expects to have a force on the grading by June and the extension completed by September.

Pemberton & Hightstown.—The Directors of the Union Transportation Co. have made a three years' lease with the Pennsylvania road for this road, which the Union Transportation Company has been operating for three years past. The rate is $500 per year, the lessee making all repairs and furnishing the rolling stock.

Pennsboro, Auburn & Glenville.—The engineers began a survey last week for this line through Ritchie county to Glenville, in Gilmor county, W. Va. The line begins at Goose Neck, near Pennsboro, and follows the south fork of the Hughes River for some distance. The length of the line to Glenville will be about 30 miles, but it is only intended to build the first 12 miles along the south fork this summer.

Philadelphia, Wilmington & Baltimore.—The Delaware legislature has passed a bill authorizing an extension of the Delaware, Maryland & Virginia, a leased line of this company, from Harbeson, Del., a point east of Georgetown, to Milton.

Piedmont Belt.—Surveys have been made for a belt line at Piedmont, Ala., about one mile long, for the most part through the land of the Piedmont Improvement Co. The road will connect the tracks of the East Tennessee, Virginia & Georgia and the East & West of Alabama. The track will probably be laid by the two roads mentioned, and it is expected that the construction work will be done with their own forces. The route is very level and little grading will be required. The road will be about 5,700 ft. long, and will extend through the manufacturing part of Piedmont.

Pittsburgh, Ohio Valley & Cincinnati.—The Gibney Co., contractors, have an increased force working on their grading contract on this road. The work of constructing the roadbed is being pushed near Moundsville, on the Ohio side of the river, and at Powhattan. On the tunnel, back of Mingo, over 3,000 ft. has been excavated, and the work of lining has been commenced.

Pittsburgh, Washington & Southern.—The officers of this company state that they have arranged to build the road to the Kanawha Valley. The preliminary surveys have been made from Waynesburg south through Monongahela, Marion and Harrison Counties, West Virginia, to Clarksburg, where a connection will be made with the Baltimore & Ohio and the West Virginia & Pittsburgh. The distance by this line will be about 30 miles.

Pittsburgh & Western.—The Ellwood Short Line, which has been built between North Sewickley and Rock Point, Pa. Three miles was opened for traffic this week, when freight was first delivered over the new line to Ellwood. Both the terminal points of the line are on the main line of the Pittsburgh & Western.

Port Arthur, Duluth & Western.—The company has the right of way cleared from its present terminus at Stanley, Ont., as far as the Minnesota state line, southeast of Whitefish Lake. Grading is making steady progress, and the company expects that the 20 miles in Ontario will be graded during the summer. It was expected that an extension of the Duluth & Iron Range would be built from Ely to connect with this road, but this plan has been changed and a charter has been secured in Minnesota, so that the company can extend its road from the state line to Ely. The line from the Minnesota state line to Ely will be 25 miles long, and a survey for the route was made last fall through valuable and extensive iron lands.

Ravenswood, Spencer & Glenville.—The road was opened for traffic May 7 from Ravenswood, W. Va., on the Ohio River, to Leroy, in Gilmer County. This part of the line is about nine miles long. The road has been completed for over half the distance from Ravenswood, where it connects with the Ohio River road, southeast to Spencer, W. Va., a distance of 30 miles. The contractors are pushing the work rapidly to the proposed terminus, and the entire line will be in operation in a few months. It is a branch of the Ohio River road.

Red River & Southwestern.—The first ten miles of the road from Henrietta, Tex., has been graded, and the contractors say that the grading will be completed to Archer City by the middle of June. The rails for the road have been ordered, and tracklaying will begin by June 10.

Richmond & Danville.—The first half of the extension of the North Carolina Midland from Winston was placed in operation May 2. The trains will not run beyond the Yadkin River until the bridge is finished. The bridge will have five spans, each 125 ft. long, and its erection will delay the opening of the line some months. The branch is to be built to Mocksville, 26 miles southwest of Winston.

Rogue River Valley.—Surveys will soon be made for a proposed extension north from Medford and Crystal Point to Eagle Point, in Jackson County, Or. The proposed extension will be about 20 miles long from Medford, but it is expected that trackage right can be secured over the Southern Pacific between Medford and Crystal Point. In that case the distance over which it will be necessary to construct the branch is 12 miles. The route is along the valley of the Rogue River, and the grading will be easy. The road now in operation extends from Jacksonville to Medford and is about five miles long. Passenger trains have only been running for a few weeks.

St. Paul & Stillwater.—A franchise has been granted to Chauncey P. Gregory, of Stillwater, Mich., for an electric railroad, to extend through Washington County from Stillwater to St. Paul. The line will be about 24 miles long. It is intended to have the road in operation for both freight and passenger traffic by Oct. 1.

Salt Lake, Hailey & Puget Sound.—The articles of incorporation of this company have just been filed in Utah. The capital stock is $3,750,000. The road is to extend along the south shore of Great Salt Lake via Grantsville, Skull Valley and Cedar Mountains to Lucin, on the Central Pacific and thence to the Idaho state boundary, 150 miles.

Sevier Valley.—The articles of incorporation of this company were filed in Utah last week by officers of the Rio Grande Western. The road is to be an extension of the narrow guage Sevier branch of that road already built from Thistle on the main line south to Manti. The road is to extend from Manti, the present Rio Grande western terminus, through the Sevier and Circle valleys to Marysvale, in Piute County, and over Fremont pass to Parowan, in Iron County, with branches to neighboring mining camps, 200 miles of road in all. Also a branch from the Marysvale line southeasterly from Salina, up through Salina cañon into Emery County, through Castle valley to the Rio Grande Western line, between Price and Green River, 120 miles. The capital stock is $8,000,000 and the cost of construction is estimated at $20,000 per mile.

Sinslaw & Eastern.—A new location has been made from Eugene west along the Sinslaw River to Florence, Or., on Sinslaw Harbor, and the company states that grading will begin on this route in about a month. The line is about 50 miles long and connects with the Southern Pacific at Fairmount.

South Bound.—A mortgage for $2,250,000 on the road of this company to be built through South Carolina from Savannah to Columbia is being recorded. The mortgage is for about $15,000 a mile. It is issued in favor of the Mercantile Trust & Deposit Co., of Baltimore, Md., to secure $2,250,000 of bonds, which will be transferred to the construction company in payment for its work.

South Florida.—Louis McLean & Co., of Savannah Ga., are reported to have been awarded the contract for building the proposed extension on this road from Pemberton, Fla., north. It is stated that the contract is for the work on the first 60 miles from Pemberton north to a point west of Gainesville near Albion, on the Florida Central & Peninsular. The survey for the line was made this spring as far north as High Springs on the Savannah, Florida & Western, a distance of about 90 miles. The survey runs parallel to the line of the Florida Southern at a distance of about 20 miles.

Waycross Air Line.—The construction work has been recently resumed near the St. Mary's terminus of this road in Camden County, Ga., on the Atlantic. About 10 miles of the road has been graded toward Waycross. The work now being done is under charge of the Chief Engineer. None of the work under progress is being done by contractors. The road is to be built to Waycross, 60 miles northeast of St. Marys.

West Virginia, Alderson & Central.—The charter of this company has been filed in West Virginia. The company proposes to build a road beginning near the mouth of East River, in Mercer County, thence down New River and to Alderson, thence to Blue Sulphur Springs and Big Clear Creek, through Greenbrier, Nicholas, Webster and Upshur Counties. The road will connect the Baltimore & Ohio, Chesapeake & Ohio, and Norfolk & Western.

West Virginia & Pittsburgh.—The extension of the main line south to Sutton, Braxton County, W. Va., has been completed and trains began running last week. The track was laid last year from Weston to Burnesville, 26 miles. The balance of the line to the Elk River, at Sutton, a distance of 20 miles, was finished a few days ago. The most important extension now under way is the line to the Gauley River, which has been surveyed.

Wheeling & Connellsville.—At a conference on May 5 of the Ohio County Commissioners at Wheeling, W. Va., and the incorporators of the proposed road, the terms of a $500,000 subscription were substantially agreed upon. For the subscription which is proposed the county is to receive second mortgage bonds. An election on the question will soon be ordered.

Windsor Belt Line.—It is proposed to connect the Canadian Pacific and Grand Trunk lines at the foot of Ouelette avenue, near Ferry Dock, on the front of the Detroit River, Windsor, Ont., and thus secure a circuit of the town from Walkerville on the east to Sandwich on the west.

Winnipeg & Hudson's Bay.—The Dominion government has promised to bring in a bill to subsidize the road to the extent of $80,000 a year, for 20 years. With the aid granted by the Manitoba Legislature, this makes a bonus of $3,000,000 and 8,000,000 acres of land. President Sutherland leaves for England this week.

Winona, Osage & Southwestern.—Articles of incorporation were filed in Iowa last week. The capital stock is $5,000,000. The office of the company is to be at Osage. This is the Iowa Division of the Winona & Southwestern, which has been built near to the Iowa state line from Winona, Minn.

Zanesville Terminal.—The connecting track between the terminal line and the Belt road on Third street, in Zanesville, O., was laid last week. The track is about half a mile long. The terminal road is now about completed. It is controlled by the Columbus, Shawnee & Hocking, and freight transfers between that line and the Baltimore & Ohio have been made for several weeks. The connection with the Cleveland, Cincinnati, Chicago & St. Louis will be made in a few days.

GENERAL RAILROAD NEWS.

Canadian Pacific.—At the annual meeting of the company held in Montreal May 13, it was reported that the net profits for last year were $6,299,700, and the amount carried forward this year is $2,656,432. Two supplementary dividends of one per cent. were paid during the year. The net profits for the first four months this year are $550,000 more than for the same period last year.

Boston & Albany.—The company has filed its report for the quarter ended March 31 with the New York Railroad Commissioners, and it is shown below:

Quarter, March 31.	1891.	1890.	Inc. or dec.
Gross Earnings	$2,121,928	$2,087,542	I. $34,386
Operating expenses	1,533,443	1,431,510	I. 101,933
Net earnings	$588,485	$656,032	I. $67,547
Charges	211,228	223,001	I. 11.773
Balance	$377,257	$433,031	I. $55,774
Since July 1.	1890-91.	1889-90.	Inc. or dec.
Gross earnings	$6,865,445	$6,854,003	I. $11,442
Operating expenses	4,582,626	4,528,004	I. 54,622
Net earnings	$2,282,819	$2,325,999	D. $43,180
Charges	1,142,383	1,135,445	I. 6,938
Balance	$1,140,436	$1,190,554	D. $50,118

Cape Fear & Cincinnati.—The company recorded last week at Southport, N. C., a mortgage on its entire property to secure $9,000,000 of 50-year five-per-cent. first-mortgage bonds, in favor of the Massachusetts Loan & Trust Co., of Boston, Mass.

Central New England & Western.—Holders of about $3,300,000 of the $5,000,000 Poughkeepsie Bridge bonds have agreed to waive interest and take scrip for two years from Feb. 1, 1891. In accordance with that agreement the scrip will be issued about June 15. A large majority of the holders of the first mortgage bonds of the Central New England & Western have also agreed to withhold interest for two years.

Chattanooga, Rome & Columbus.—The stockholders of the road met in Rome May 7 to consider a proposition from the Savannah & Western road, one of the Central of Georgia lines, for the purchase of the former's property. The Savannah & Western proposes to indorse $2,224,000 five per cent. mortgage bonds issued by the above road and now outstanding, and, in addition thereto, agrees to transfer to the stockholders of the latter road $400,000 of its five per cent. bonds. All the property and rolling stock is to be transferred to the Savannah & Western, two-thirds of the common stock and $1,140,000 of income bonds. It was voted to accept the proposition.

Cincinnati, Wabash & Michigan.—At the special meeting of the stockholders of the road in Elkhart, Ind., May 9, the operating agreement with the Cleveland, Cincinnati, Chicago & St. Louis was ratified, as was the proposition to place a blanket mortgage on the line from Benton Harbor to North Vernon for $4,000,000, bonds of the latter company to that amount being secured by the mortgage.

The Vernon, Greensburg and Rushville division of the Cleveland, Cincinnati, Chicago & St. Louis, extending from Rushville to North Vernon, 45 miles, was formally turned over to this road May 1, and becomes a part of the system. Through passenger trains run between North Vernon and Benton Harbor, and in about two weeks this service will be extended through to Louisville over the Ohio & Mississippi, thus forming a new through line from Louisville, Ky., to Benton Harbor, on Lake Michigan.

Fitchburg.—The Fitchburg Company this week sold $500,000 five per cent. 10-year bonds to Kidder, Peabody & Co., being the last of the issue of $1,000,000 authorized by the shareholders. The first $500,000 were issued as 30-year four per cents., and bore date of June 2, 1890. Of these $100,000 were used to take up a like amount of Cheshire division fours. Of the balance, $275,000 were turned over to the state on account of the Southern Vermont purchase and rental. The remaining $125,000 were sold to Kidder, Peabody & Co. some time since. On June 30 the company had a floating debt of $780,000. To the payment of this the proceeds of the $125,000 fours and $500,000 fives is applied.

The following is the statement of operations for the three months and the nine months to March 31:

Quarter to March 31:	1891.	1890.	Inc. or dec.
Gross earnings	$1,626,148	$1,553,291	I. $72,857
Oper. expenses	1,288,764	1,146,593	I. 142,271
Net earnings	$337,384	$406,698	I. $69,314
Charges	347,824	357,450	D. 9,026
Surplus	Def. $10,440	$49,248	D. $59,688
July 1 to March 31:			
Gross earnings	$5,169,937	$5,024,709	I. $145,228
Oper. expenses	3,688,526	3,448,707	I. 239,819
Net earnings	$1,481,411	$1,576,002	D. $94,591
Charges	1,013,781	1,006,974	I. 6,807
Balance	$467,630	$569,028	D. $101,398

Great Northern.—The following report gives the gross earnings of the system for April.

	1891.	1890.	Inc. or dec.
Great Northern	$789,484	$747,488	I. $41 996
Montana Central	107,124	84,198	I. 22,926
East of Minnesota	66,701	42.732	I. 24,669
Total	$963,3 9	$874,418	I. $88,891

From July 1 to April 30 the earnings were:

Great Northern	$8,962,218	$7,811,241	I. $1,151,977
Montana Central	1,033,844	786,369	I. 247,475
East. of Minnesota	614,559	619,512	D. 4,953
Total	$10,610,621	$9.217,122	I. $1,393,489

Kansas & Colorado Pacific.—The several lines of the Missouri Pacific in Kansas have all been consolidated under the above name, the consolidation being made for the convenience of the company in the management of the system. The companies consolidated under the new management are the following: Council Grove, Osage City & Ottawa; Topeka, Salina & Western; Missouri Pacific Railway Co., in Kansas; Denver, Memphis & Atlantic; Council Grove, Osage City & Ottawa; Council Grove, Smoky Valley & Western; Kansas, Nebraska & Dakota; Salina, Sterling & El Paso; Wichita & Colorado; Verdegris Valley, Independence & Western Grouse Creek and Interstate.

Northern Pacific.—The full statement of the earnings for March is as follows:

Gross earnings	$1,777.945	$406.575	$2,184,522
Operating expenses	1,099,693	249,643	1,349,337
Net earnings	$678,252	$156,932	$835,185

Miscellaneous income was $279,238, and total net in-

come $1,114,423; all charges amounted to $1,031,867, leaving a surplus of $82,556.

The net earnings of the Wisconsin Central were $156,932, and the rental was $164,879. As compared with March of 1890, the gross earnings of the Northern Pacific increased $101,365. For the year to date the earnings were as follows:

Nine months.	1891.	1890.
Gross earnings	$19,477,680	$16,792,255
Operating expenses	11,215,014	9,540,613
Net earnings	$8,232,636	$7,251,642
Wis. Central net	1,466,128	
Total net	$9,698,768	$362,000
Misc. income	846,246	
Total earnings	$10,545,005	$7,613,642
All charges	9,089,086	6,243,180
Surplus	$1,455,919	$1,370,462

The preferred stock was cancelled to the extent of $67,232 in March, and there is now outstanding $36,729,994.

Michigan Central.—The annual report of the company shows the following operations:

	1890.	1889.	Inc. or dec.	
Gross earn	$14,490,711	$13,786,925	I.	$703,786
Oper. expen	10,701,754	9,855,158	I.	806,596
Net earn	$3,788,957	$3,891,767	D.	$102,810
Charges	2,454,331	2,512,526	D.	58,195
Balance	$1,334,626	$1,379,241	D.	$44,615
To Can. So	355,633	407,445	D.	51,812
Balance	$948,993	$971,796	D.	$22,803
Other incomes	57,493	38,934	I.	18,559
Total	$1,006,486	$1,010,730	D.	$4,244
Dividends	936,911	936,911		
Surplus	$69,575	$73,819	D.	$4,244

New York, Chicago & St. Louis.—The annual report for the year ending Dec. 31, 1890, gives the following summary of figures:

	1890.	1889.	Inc or dec.	
Gross earn	$20,865,759	$19,487,196	I.	$1,378,562
Operating expenses	14,220,480	12,847,451	I.	1,373,029
Net earn	$6,645,278	$6,639,745	I.	$5,533
Net charges	3,344,734	3,423,468	D.	78,734
Balance	$3,300,544	$3,216,277	I.	$84,267
6% div	2,967,990	2,473,325	I.	494,665
Surplus	$332,554	$942,952		$410,398

New York & New England.—The company has leased its short Dedham branch, from Winslow to Dedham Centre, Mass., to the Old Colony for a rental of $6,000 a year. It has been discovered that a clause in the charter prohibits the sale of the line, which was contemplated.

Norfolk & Western.—The stockholders have authorized an allotment of 85,000 shares of preferred stock at 52½ per cent. Present stockholders are entitled to subscribe to the extent of 21 per cent. of their present holdings. If all the stock is taken the company will receive about $4,500,000. Of this amount $2,000,000 will be used to pay off a collateral trust loan. Of that amount, which is practically a floating debt, $2,500,000 will be expended in constructing the Ohio extension, now half completed, and the balance will be spent for additional facilities for handling the traffic of the main line.

Pennsylvania.—A decision was made at Harrisburg, Pa., May 8, in the appeal of the company from the settlement of the state's accounting officers for the tax on the capital stock for the years 1872 to 1887 inclusive. By the court's opinion the claim of the state, which was about $1,000,000, is cut down about one-half. An appeal will be taken by the company to the Supreme Court. The judge decides that the company is not exempted from taxation on its capital stock by the clause in its charter relative to taxation, and if such exemption ever existed it was repealed by the taxing acts of 1874, 1877 and 1879, under which the taxes are claimed in this case.

Pensacola & Atlantic.—The road was sold at Pensacola, Fla., last week, by the special commissioner of the United States District Court. The road was purchased for $250,000 on behalf of the bondholders' committee. The road is part of the Pensacola Division of the Louisville & Nashville, and is 18 miles long, extending to Pensacola.

Philadelphia & Reading.—Judge Simonton handed down at Harrisburg, Pa., April 30, an opinion in two cases on appeal by the company from two settlements made against it by the auditor-general and state treasurer, Aug. 15, 1889, for tax on loans for the years 1887 and 1888. Judgment is directed to be entered in favor of the commonwealth and against the defendant in the sum of $206,575.

Philadelphia, Wilmington & Baltimore.—The Delaware House of Representatives this week passed a bill embodying an agreement in reference to the mortgages for $600,000 held by the state on the Junction & Breakwater and Breakwater & Frankford roads. The bill provides for the payment by the Philadelphia, Wilmington & Baltimore of $215,000 and accruing interest in two cash payments. The balance, $385,000, is to stand on mortgage at three per cent. interest, the mortgage to run 40 years, but redeemable at the option of the railroad company at any time after Jan. 1, 1895. The roads are now operated by the Philadelphia, Wilmington & Baltimore.

Southern Pacific Co.—The annual report of the company gives the following summary of operations for the year ended Dec. 31:

	1890.	1889.	Inc. or dec.	
Mileage	6,226	6,052	I.	174
Earnings	$48,201,995	$46,343,208	I.	$1,858,787
Expenses	31,007,730	30,304,366	I.	703,364
Net	$17,194,265	$16,038,842	I.	$1,155,423
Rentals	509,516	521,952	D.	12,436
Total net	$37,793,781	$16,560,794	I.	$1,142,987
Taxes, etc	2,292,713	2,141,961	I.	160,752
Balance	$15,411,068	$14,428,833	I.	$982,235
Other income	712,500	668,001	I.	44,499
Total	$16,123,568	$15,09.,834	I.	$1,026,734
Charges	16,328,461	15,393,308	I.	935,153
Deficit	$204,893	$296,474	D.	$91,581

Pine Bluff & Swan Lake.—F. M. Gillette, of New York, and T. M. Leslie, of Stuttgart, Ark., on behalf of A. C. Barstow, of Providence, R. I., the largest bondholder, have made application to the United States Court for the appointment of a receiver for this road. For several years past it has been under the management of J. R. Campbell, who, as the representative of the stockholders, refuses to give possession.

Savannah, Americus & Montgomery.—The stockholders of the company at a meeting in Americus, Ga., May 6, ratified the action of the directors in increasing the capital stock of the company, as authorized by the last legislature. The legislative act authorizes an increase to $5,000,000.

Tennessee Coal, Iron & Railroad.—At the meeting of the stockholders of the company at Tracy City, Tenn., May 7, the proposition of the English syndicate to purchase the Tennessee property of the company for $2,500,000 submitted by the directors was rejected by a two-thirds vote.

Union Pacific.—The preliminary statement of March earnings shows the following changes from 1890:

Month of March.	1891.	1890.	Inc. or dec.	
Miles	7,668	7,561	I.	106
Gross earn	$3,176,857	$3,485,584	D.	$308,726
Operating expenses	2,159,999	2,426,633	D.	266,634
Net earnings	$1,016,858	$1,058,950	D.	$42,091
Jan. 1 to March 31.				
Gross earnings	$8,884,868	$8,516,742	I.	$368,125
Operating expenses	6,188,967	6,459,166	D.	270,199
Net earnings	$2,695,901	$2,057,576	I.	$638,325

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, May 13, 1891.

The meeting of the Western Passenger Association was not productive of much in the way of a settlement of the important matters which were before it. Attempts were made to agree upon round-trip rates to the annual Grand Army reunion at Detroit and also to the National Teachers' Association convention at Toronto; also to agree upon summer tourists' rates. The Alton claims to be willing to join the other lines in any scheme to cover this business in any way that it can be done without interfering with the Alton's position in regard to the Eastern lines. On the other hand, the other lines claim that the Alton stands in the way of making any rates whatever. As regards the meeting at Toronto, the Alton is willing to vote for rates via the Chicago & Grand Trunk and the Wabash and Canadian Pacific, but will not agree to the other routes; and the rest of the lines are naturally not inclined to restrict tickets to those routes. Consequently, action had to be deferred and the whole subject is left in uncertainty. The ever-recurring subject of northwestern rates in connection with the "Soo" line was taken up, but no agreement was reached.

A complication has arisen in the Central Traffic Association which is likely to result in considerable friction before it is adjusted. It is in many respects similar to the action of Traffic Manager Leeds in the sugar rate question in the Western Traffic Association. The Big Four has filed a tariff on highwines, Peoria to New York, which reduces the rates 6 cents per 100 lbs. below the authorized Association tariff. As it reduces the rate to 32½ cents, it lowers it below the Chicago basis, which is 35 cents. Peoria is what is known as a 110-per-cent. point on the Chicago basis, and this is the first time that the percentage basis has been ignored. The Big Four claims to have no desire to interfere with the other rates, and only took this action in order to meet openly the rates which were being made secretly by its competitors from that point. Chairman Blanchard refuses to acknowledge the Big Four's right to do this, and refuses to issue the tariff under Association authority. It is not likely that serious disturbance in the rate situation will result, but there is an excellent opportunity for testing the strength of the Association and perhaps to bring to light some other matters.

General Traffic Manager Busenbark, of the Chicago, St. Paul & Kansas City, has recently returned from a trip through Iowa, Minnesota, Wisconsin and the Dakotas, and says that all indications point to the largest grain crop in the history of those states; and that after July 1 it will be a question of sufficient cars and engines rather than of tonnage.

The Western Freight Association is in session this week. As the Advisory Board took no action looking to the settlement of the conflicting interests of the Western Traffic and the Western Freight associations, the same obstacles present themselves that were present when the docket was passed in April, and Chairman Midgley is likely to find himself considerably embarrassed in his rulings.

The Pennsylvania has moved its city ticket office from 65 Clark street to 248 Clark (Grand Pacific Hotel block). The general trend of all the city ticket offices is steadily down-town, and it is not unlikely that more of the lines now having offices north of Madison street will move south.

The federal grand jury at Topeka failed to find indictments against the firm of Howell, Jewett & Co., lumber dealers, for alleged bribing of weighmasters whom Superintendent Carman of the Western Weighing Association and Inspection Bureau has been collecting evidence against for several months. It is said that a number of civil suits for damages are likely to be instituted by the roads for having been defrauded of revenues by false weights.

Traffic Notes.

H. W. Hartman and C. R. Wylie have been indicted at Pittsburgh, Pa., by the United States Grand Jury for giving false weights in shipping steel wire.

The American Express Company withdraws entirely from the Fitchburg Railroad on May 15, and the National Express Company will have exclusive control of the route.

The Cincinnati, Wabash & Michigan has established the "Elkhart Fast Freight Line" between Ohio River points and Milwaukee and points beyond, the route being from Benton Harbor to Milwaukee.

The Jacksonville, Tampa & Key West has served notice on Commissioner Slaughter that it will withdraw from the Southern Passenger Association on June 6. A reorganization of the association is predicted.

A St. Louis dispatch states that Joseph S. Leeds, ex-Freight Traffic Manager of the Missouri Pacific, has been offered the position of Commissioner of the St. Louis Traffic Commission Freight Bureau at a salary of $10,000 per annum.

The Providence Line steamers between New York and Boston will begin running for the season on Monday, May 18. The "Connecticut" and "Massachusetts" will be put on this run, leaving New York from Pier 29, North River, at 5:30 P. M.

The New York & New Jersey Car Service Association, the territory of which includes New York City and all the terminals on the opposite side of the Hudson River, will begin operations June 1. The office of the manager, Mr. F. E. Morse, is at 143 Liberty street, New York.

The Interstate Commerce Commission will meet in St. Paul on May 21, and listen to complaints of Fargo and other Northwestern merchants regarding the rate on sugar, which is 97 cents per 100 lbs. from San Francisco, 37 more than the rate to St. Paul.

Wheat is being carried for five cents a bushel from Chicago to New York. It goes by lake to Buffalo, thence by the Erie Canal. Of the five cents the lake boats get 1⅞ cents, the Buffalo elevators seven-eighths and the Erie Canal boats the remainder.

A San Francisco dispatch states that the Interstate Commerce Commission has, on complaint of San Francisco jobbers, ordered the Southern Pacific to reduce its rates on tea for the complainants to conform to the rate charged upon through shipments from China and Japan to Eastern points. It would appear that this order is based on the ruling of the commission in the New York complaint concerning goods imported from Europe and shipped westward from the Atlantic seaboard. Vice-President Stubbs of the Southern Pacific is reported as saying that the order will not be obeyed. This is a pronounced case of compulsory low tariff, forced upon the road by direct and well-defined competition, and the road proposes to have this case taken before the courts for a test of the legal question involved.

Western Traffic Association.

The adjourned session of the second quarterly meeting of the advisory board of this association convened at the Windsor hotel, New York, May 6. The only line unrepresented was the Southern Pacific. The following changes in the By-Laws were adopted:

Section 7 of Article VII was amended so as to allow the Commissioner of any division upon request in cases of special urgency to authorize temporary relief against the action of outside lines, when such action will not affect lines located in other divisions. The section as originally adopted required the united action of all the Commissioners to grant relief.

Section 9 of Article VII was amended by providing that four members of the Board of Commissioners shall constitute a quorum for hearing questions brought before the Commissioners, the absent members to be furnished with verbatim reports of the proceedings, and must participate in the decision of the question. This will enable the Commissioners to proceed with the hearing in cases where one or two of their number may be unable to be present on account of other meetings, etc.

Article VIII was amended by providing that the action of freight-rate and passenger-rate committees shall be considered as approved by the General Manager or highest traffic officer, as provided in the original article, unless notice of disapproval is received by the Commissioner having the matter in charge by mail or wire within 10 days after submission by him in the case of officials resident on the Pacific coast, 8 days in the case of officials in Colorado and Utah, and 5 days in other cases.

The report of the Commissioners respecting the issuance of the unauthorized sugar tariff by the Missouri Pacific being taken up, J. S Leeds, Traffic Manager of that company, made a statement of the transaction in which he affirmed what had been already stated by President Gould, that he issued the tariff solely on his own responsibility. Mr. Leeds submitted a long statement in defense of his action, but the board decided that "the Missouri Pacific, through the action of its Freight Traffic Manager, has violated the agreement substantially as presented by the Commissioners." Mr. Gould thereupon announced the intention of his company to act in conformity to the agreement and abide by the finding of the board in the matter Later the discharge of Mr. Leeds for violating the agreement was made known.

The board then took up the report of the Commissioners respecting the abolishing of outside agencies, and after discussion unanimously adopted resolutions to the effect that the life of the association ought to be extended for a fixed period—say, to January 1, 1896; that the Commissioners prepare a plan for joint agencies, and that they investigate the matter of division by percentages of the competitive tonnage arising at joint agencies and the routing thereof.

The members at the conclusion of the meeting very generally expressed satisfaction at the results accomplished, and the belief that the association had been materially strengthened by the action taken; and that when the various details of the organization had been worked out the lines not now members would become satisfied that the intent was to carry out the agreement in all particulars and would then join.

Mississippi Valley Association.

At a meeting last week of the presidents and managers of various Southern roads composing the Mississippi Valley Association (the Illinois Central, Mobile & Ohio, Newport News & Mississippi Valley, Louisville & Nashville, Nashville, Chattanooga & St. Louis, Queen & Crescent, Kansas City, Memphis & Birmingham, Memphis & Charleston and East Tennessee, Virginia & Georgia), E. B. Stahlman, of Nashville, was unanimously elected Commissioner. Major Stahlman was, until recently, third Vice-President of the Louisville & Nashville.

East-Bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, May 9, amounted to 55,508 tons, against 52,989 tons during the preceding week, an increase of 2,519 tons, and against 68,171 tons during the corresponding week of 1890, a decrease of 12,663 tons. The proportions carried by each road were:

	Wk. to May 9.		Wk. to May 2.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	8,419	15.1	7,191	13.6
Wabash	3,907	7.1	5,430	10.2
Lake Shore & Michigan South.	7,692	13.9	6,982	13.2
Pitts., Ft. Wayne & Chicago	6,121	11.0	5,575	10.5
Chicago, St. Louis & Pitts.	6,552	11.8	6,920	13.1
Baltimore & Ohio	2,978	5.4	3,314	6.2
Chicago & Grand Trunk	5,834	10.5	5,131	9.7
New York, Chic. & St. Louis	7,956	14.3	6,427	12.1
Chicago & Atlantic	6,052	19.9	6,019	11.4
Totals	55,508	100.0	52,989	100.0

Of the above shipments 3,107 tons were flour, 24,624 tons grain, 4,036 tons cured meats, 779 tons lard, 7,045 tons dressed beef, 1,070 tons butter, 716 tons hides, 211 tons wool and 6,704 tons lumber. The three Vanderbilt lines together carried 43.3 per cent., while the two Pennsylvania lines carried but 22.8 per cent.